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CSIRO ABSTRACTS

Vol. 21, no. 9 September, 1973

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ABSTRACTS OF CSIRO PUBLISHED PAPERS

The ABSTRACTS cover work published by the research staff of the Organization. Requests for copies of original papers should be addressed to the RELEVANT DIVISION.

* indicates the author is not an officer of CSIRO.

HEAD OFFICE

P. O. Box 225, Dickson, A. C. T. 2602.

1093 --- Scientific and common names of insects and allied forms occurring in Australia.
Bull. CSIRO Aust. no. 287, 47 p. (1973)

DIVISION OF PLANT INDUSTRY

P. O. Box 1600, Canberra City, A. C. T. 2601.

1094 ANDERSON, A. J., MEYER, D. R. and MAYER, F. K.
Heavy metal toxicities: levels of nickel, cobalt, and chromium in the soil and plants associated with visual symptoms and variation in growth of an oat crop.
Aust. J. agric. Res. 24(4):557-71, 34 refs. (1973)

Toxicity was studied in a field crop of oats on a soil developed in an area where ultrabasic rocks occur. An area selected for sampling showed a range of toxicity from the border where plants were normal to the centre where plants were most affected. The total nickel, cobalt, and chromium

contents of the soil increased to high levels at the centre of the area. Concentration of the elements in soil solutions extracted with a centrifuge from soils at field capacity were in the order nickel > cobalt > chromium, the order in which they are found in natural waters. In the soil solutions nickel ranged from 0.13 to 3.25 p.p.m., cobalt from 0.03 to 0.14 p.p.m. and chromium from 0.01 to 0.02 p.p.m. Concentrations found in the soil solutions were compared with concentrations known to induce toxicities in oats grown in frequently renewed solution cultures. These comparisons indicated that the nickel ranged up to levels which were definitely toxic. At its highest level cobalt was present at less than one-tenth of the level needed to induce toxicity, while chromium was present at only one-hundredth of the minimum level for toxicity. Analyses of the tops of plants from the centre of the area indicated values of chromium which would be considered toxic, but because of the very low concentrations of chromium in the soil solutions it was considered more likely that the chromium detected was in soil material which the acid detergent washing procedure failed to remove. Results indicate the particular importance of contamination by chromium. Nickel was present in much higher quantities at toxic levels. Cobalt was below toxic levels. The symptoms observed in the field and those induced by the application of nickel to oats in pot cultures are described. A feature of these symptoms was a regular succession of chlorotic bands. The evidence suggested that the banding pattern, which is best developed in clear weather, relates to the changing conditions which influence the actively growing tissue as the leaf is emerging. The symptom provided a means of identifying nickel toxicity in the field. Degrees of toxicity were related to levels of elements in soil extracts and in the plants.

1095 ANDERSON, Jan M., THAN-NYUNT* and BOARDMAN, N.K.
Light-induced redox changes of cytochrome B-559.
Archs Biochem. Biophys. 155:436-44, 24 refs. (1973)

Dark incubation of spinach or pea chloroplasts with 10 μM carbonylcyanide m-chlorophenylhydrazone (CCCP) had a negligible effect either on the redox state or the redox potential of the high potential form of cytochrome b-559 (cytochrome $b\text{-}559_{HP}$). A similar result was obtained with spinach chloroplasts on incubation with 3.3 μM carbonylcyanide p-trifluoromethoxyphenylhydrazone (FCCP), but pea chloroplasts showed a decrease of 10-20% in the amount of reduced cytochrome b-559. Light-induced redox changes of cytochrome b-559 were not observed in untreated spinach chloroplasts. In the presence of CCP or FCCP, cytochrome b-559 was photo-oxidized both in 655 nm actinic light and in far-red light. Addition of the plastoquinone antagonist, 2,5-dibromo-3-methyl-6-isopropyl-p-benzoquinone (DBMIB) to CCCP- or FCCP-treated chloroplasts had only a small effect on the photo-oxidation of cytochrome b-559 in 655 light, but it completely inhibited the oxidation in far-red light. Electron flow from water to 2,3',6-trichlorophenolindophenol was partly inhibited by CCCP or FCCP, but the degree of

inhibition does not appear to be sufficient to account for the photo-oxidation of cytochrome b-559. The photo-oxidation of cytochrome b-559 by 655 nm light at liquid nitrogen temperature was not influenced by prior treatment of the chloroplasts at room temperature with CCCP, DBMIB, or CCCP + DBMIB. The results cannot be explained by the presence of two independent pools of cytochrome b-559 in CCCP-treated chloroplasts, one photo-oxidized by Photosystem II and the other photo-oxidized by Photosystem I and photoreduced by Photosystem II.

1096 ASTATKE HAILE*, GAULT, R.R. and BROCKWELL, J. Evaluation of symbiotic response in introduced lines of adzuki bean [Phaseolus angularis (Willd.) Wight]. Pl. Introd. Rev. Div. Pl. Ind. CSIRO Aust. 9(2):19-24, 6 refs. (1973)

Symbiotic behaviour of 13 lines of adzuki bean was examined. The species responded strongly to inoculation, with one Rhizobium strain (CB 453) significantly superior to three others including the commercial CB 756, ordinarily used for azuki bean inoculation. In spite of this, use of CB 453 is not advocated for commercial sowings until it has been proven equal to or better than CB 756 in a number of established criteria for inoculant strains. CB 453 will be readily available to research workers who require highly effective rhizobia for azuki bean.

1097 BERGERSEN, F.J. and GOODCHILD, D.J. Aeration pathways in soybean root nodules. Aust. J. biol. Sci. 26(4):729-40, 11 refs. (1973)

Soybean root nodule tissues contain many interconnected gas-filled intercellular spaces. They have been studied, in fresh and embedded tissue during the development and functional life of the nodules, by light and electron microscopy. Four anatomically different types of intercellular space were recognized in the bacteroid zone. These differed in distribution from the outside of the zone to the centre of the zone. There were fewer intercellular spaces in the outer cortex than in the bacteroid zone, but they were continuous and appeared to be adequate to conduct the observed fluxes of oxygen with only moderate differences in concentration between the outside of the bacteroid zone and the atmosphere. The observations suggested that aeration of the nitrogen-fixing tissue of mature nodules is accomplished primarily by radial gaseous diffusion from the external atmosphere through a network of 3,000-30,000 air-filled intercellular spaces per nodule in the cortex and up to 100,000 air spaces per nodule in the bacteroid zone, where each space has an average cross-sectional area of 1-5 μm^2.

1098 BERGERSEN, F. J. and GOODCHILD, D. J. Cellular location and concentration of leghaemoglobin in soybean root nodules. Aust. J. biol. Sci. 26(4):741-56, 22 refs. (1973)

The reaction of leghaemoglobin (Lb) with oxidized 3,3'-diaminobenzidine was used to demonstrate localization of this haemoprotein within the membrane envelopes surrounding the bacteroids in soybean root nodule cells. In fresh tissue sections mounted in a modified Honda medium, the reagent stained the envelope contents a brick-red colour. The cytoplasm between the envelopes and the host nucleus was not stained. Upon fixation with buffered 1-2% glutaraldehyde, purified Lb lost up to 40% of its haem; however, sufficient remained bound to the precipitate to allow the diaminobenzidine to react. The stained precipitate, although not highly coloured by the reagent, reacted strongly with OsO_4 to produce a more electron-dense material than unstained, OsO_4-treated, fixed Lb. This reaction was used to confirm the localization of Lb by electron microscopy of sectioned nodule tissue. It was concluded that precipitated material within the envelope space was Lb. Growth, C_2H_2-reducing activity, Lb content, and structure of soybean nodules were measured during glasshouse growth of Lincoln soybeans. Volumes of the membrane-envelope space were calculated from measurements of nodule volume and light and electron micrograph profile areas. Lb was detected on the second day after nodules appeared, and C_2H_2-reducing activity was detected on day 4. The number of membrane envelopes per cell was constant from day 4, but multiplication of bacteria within them continued until day 13. As the nodules increased in size, activity and Lb content and concentration within the envelopes increased. At 8 days, when average Lb per nodule was 0.17 ± 0.03 nmole, the concentration within the envelopes was 0.36 mM. At 36 days, when activity reached its maximum, the Lb content per nodule was 19.2 ± 0.9 nmoles and the concentration was 1.53 mM.

1099 COALDRAKE, J. E. Minerals, man and landscape. Hemisphere 17(6):9-15 (1973)

Three major sources of conflict over open-cast mining in Australia are: the fact that many important deposits are on or near the coast, where there is a relatively dense population; that some deposits are in places people want to preserve for ecological reasons, recreation or other forms of land use; and that some mining Acts still give preference to mining over other forms of land use. Examples of open-cast mining are presented which show that many of the major problems of conservation it raises resemble those raised by other types of land use that disturb the landscape. Mining, like all forms of land use, should be integrated into comprehensive regional planning before access to a given area is granted.

1100 COSTIN, A. B. and GROVES, R. H. (eds.) Nature conservation in the Pacific.
Proc. Symp. Nature Conservation in the Pacific, Canberra, 1971. Canberra, Australian National University Press, 1973. 337 p.

1101 HODKINSON, K. C. Establishment and growth of shoots following low and high cutting of lucerne in relation to the pattern of nutrient uptake.
Aust. J. agric. Res. 24(4):497-510, 28 refs. (1973)

Lucerne plants (Medicago sativa cv. Hunter River) were either frequently or infrequently cut down and subsequent differences in shoot regrowth were compared in two experiments. The first experiment demonstrated that differences in final shoot weights arose from differences developed during the first seven days of regrowth. High level cutting (15 cm) increased the shoot yield of frequently but not of infrequently cut plants. Net uptake of both nitrogen and phosphorus was related to the growth rate of shoots until commencement of flowering, when uptake ceased for c. 15 days even though both roots and shoots continued to gain weight. Towards the end of flowering uptake of nitrogen and phosphorus recommenced and accumulation of both nutrients occurred in the tap-root and lateral roots. The relative nitrogen and phosphorus content of leaves on crown shoots was highest on day 7 and the same for frequently and infrequently cut plants. Leaves on crown and stubble shoots seven days after high level cutting had a significantly lower relative nitrogen and phosphorus content than leaves on plants cut low. Thereafter the relative nitrogen and phosphorus content of all leaves declined with the greatest decline occurring after the commencement of flowering. In the seond experiment early morphogenesis of the shoot population was investigated. Establishment of shoots was completed between three and five days after cutting. Higher shoot weights on infrequently cut plants were accounted for by a larger number of small shoots at the time of cutting. Relative growth rates of shoots did not appear to be influenced by prior cutting frequency. The relative nitrogen content of buds and shoot apices was low at cutting but doubled within two or three days and then declined after day 7. These results are discussed in relation to the role of "plant factors" in shoot regrowth of lucerne.

1102 MARSHALL, D. R., BROUE, P. and PRYOR, A. J.
Adaptive significance of alcohol dehydrogenase isozymes in maize.
Nature New Biol. 244(131):16-17, 21 refs. (1973)

The effects of alcohol dehydrogenase isozymes specified by the Adh_1^F (fast) and Adh_1^S (slow) alleles in maize on the fitness of their carriers in normal and flooded soils are reported. It was found that Adh_1^S homozygotes, Adh_1^F homozygotes and $Adh_1^S Adh_1^F$ heterozygotes grew equally well under normal conditions but under flooding Adh_1^F homozygotes showed significantly lower rates of root growth and slightly lower top growth rates. Heterozygotes

were intermediate between the two homozygotes. The results support the suggestion that Adh_1 alleles significantly affect the fitness of their carriers in waterlogged soils.

1103 NEAL-SMITH, C. A. Pasture species introduction and investigations over a 38 year period and future possibilities. Pl. Introd. Rev. Div. Pl. Ind. CSIRO Aust. 9(2):10-18 (1973)

Reminiscences of a long career in plant introduction and selection, particularly for Australian pasture improvement, recall the history of many grass and legume cultivars now in commercial use. The need for continuing this work by further international exchange of training and information is stressed as a means of providing directly or by breeding, sustained seasonal feed supplies for a higher level of animal production.

1104 WEBB, L. J. Environmental boomerang. Milton, Qld., Jacaranda Press Pty. Ltd., 1973. 124 p.

Much of the waste and garbage which we try to throw away today has an annoying trick of turning on us. Our technological trash is exceeding the ability of our environment to assimilate it safely. There is no more 'away' to throw things. We are on 'Spaceship Earth' and radioactive waste, chemical waste, garbage, sewage, motor-car exhausts, stack emissions and the like are severely taxing our biosphere. A pressure applied on the environment in one direction may return to us from some other quarter, with drastic results. When we clear forests and allow land to erode on the mountainside, we often find fish and fishermen many miles away suffering the consequences. These environmental problems are considered by means of five 'case histories' which include: soil erosion, killing and poisoning of wildlife, water pollution, air pollution and sensory stimuli and stress (which deals mainly with noise and crowding in urban living). Awareness of these problems is increasing substantially in Australia.

1105 WEBB, L. J., TRACEY, J. G., KIKKAWA, J.* and WILLIAMS, W. T.† Techniques for selecting and allocating land for nature conservation in Australia. In: Nature Conservation in the Pacific: Proc. Symp. Nature Conservation in the Pacific, Canberra, 1971. Canberra, Australian National University Press, 1973. pp. 39-52, 28 refs.

The more formal biological problems of habitat classification of tropical rain forest areas are considered and the results of pilot surveys to relate the vegetation communities recognized by plant ecologists to the distribution and abundance of wildlife, using birds as a convenient indicator of fauna are presented. Birds are used as a model for other forms of wildlife for the following reasons: birds form part of wildlife; they are taxonomically best known; estimates of their numbers are more reliable than those of other forms; they represent a wide range of higher trophic levels and thus reflect

community organization; they are sensitive to changes in environment; therefore the classification based on their distribution and diversity is most likely to produce habitat systems also applicable to other forms of wildlife; they are easier to see than other wildlife.

† Division of Tropical Agronomy

1106 WIMBUSH, D. J. and COSTIN, A. B. Vegetation mapping in relation to ecological interpretation and management in the Kosciusko Alpine Area.
Tech. Pap. Div. Pl. Ind. CSIRO Aust. no. 32, 22 p., 18 refs. (1973)
A method of mapping alpine vegetation using oblique colour photography to aid in the interpretation of standard black and white aerial photographs is described. A map of the Kosciusko alpine area at a scale of 1 : 31,680 is presented, with an inset showing its relation to the forest vegetation of the Kosciusko Primitive Area. Examples of uses of the map are given for park management, interpretive and scientific purposes.

DIVISION OF TROPICAL AGRONOMY

Cunningham Laboratory, Mill Road, St. Lucia, Qld 4067.

1107 COALDRAKE, J. E. Conservation problems of coastal sand and open-cast mining.
In: Nature Conservation in the Pacific: Proc. Symp. Nature Conservation in the Pacific, Canberra, 1971. Canberra, Australian National University Press, 1973. pp. 299-314, 28 refs.
Some of the causes and principles that lie behind the rapidly increasing conflict between mining and the requirements of conservation are shown by examining a few major areas of open cast mining. There are numerous other sites where similar conflicts exist or are likely to start, but behind all of them lies the need for proper regional planning before land is allocated to any use. In the case of land bearing mineral deposits in Australia it is hard to see either the conservationists or the miner obtaining decisions both rationally based and satisfying, unless there is amendment of the relevant mining laws, and the introduction of comprehensive legislation for regional planning.

1108 EDYE, L. A., BURT, R. L., WILLIAMS, W. T., WILLIAMS, R. J. and GROF, B. * Preliminary agronomic evaluation of Stylosanthes species.
Aust. J. agric. Res. 24(4):511-25, 9 refs. (1973)
Relative merits of morphological and agronomic attributes for the classification of cultivars are discussed; reasons are given for suggesting that a purely agronomic classification would be a valuable supplementary

technique. A polythetic divisive program was used to classify 272 Stylosanthes accessions which had been grown in three spaced-plant experiments. Eleven agronomic attributes were used, and the agronomic groups generated were compared with the morphological-agronomic groups previously reported. The two classifications were broadly in agreement for all species except S. guyanensis, in which the agronomic classification revealed important variation. It is shown that the agronomic classification is an effective means of detecting agronomic heterogeneity within a morphological-agronomic group, and is particularly useful in elucidating inter-site differences in performance. It is suggested that the double classificatory approach provides a systematic method for the preliminary evaluation of accessions, and a rational means of selecting accessions for further experiments.

1109 GATES, C. T. Comparative efficiency of development under cold stress of the tropical legumes Lotononis bainesii Baker and Stylosanthes humilis H.B.K.
Aust. J. biol. Sci. 26(4):693-704, 14 refs. (1973)

The efficiency of development of L. bainesii and S. humilis in response to increasing, specific amounts of cold stress was compared. The plants were grown under controlled environment with favourable lighting and day length regime typical of the advancing autumn season in subtropical regions. Two temperature regimes were imposed, a "normal" regime typical of the field during frosting, and a "chilled" regime, some 10°C lower than the normal. Both legumes suffered a pronounced check to development, but the greater magnitude of effect was on S. humilis, especially with chilled roots. The superiority of L. bainesii was apparent from visual observation, was demonstrated in the multivariate sense by numerical techniques, and was confirmed by the principal discrete growth responses. The attributes making the major contribution were: the ratio of root to tops dry weight, the levels of tissue water, and the relative nitrogen content of the tops. Their responses confirmed a greater measure of cold tolerance possessed by L. bainesii when compared with S. humilis. They also indicated a greater capacity in L. bainesii to harden under these conditions of gradually increasing cold stress. The cold tolerance of L. bainesii is a valuable propensity for a tropical pasture legume, and warrants the fullest exploitation both in practice and by further scientific evaluation as a comparison with S. humilis at the metabolic level.

--- WEBB, L. J.†, TRACEY, J. G.†, KIKKAWA, J.* and WILLIAMS, W. T. Techniques for selecting and allocating land for nature conservation in Australia.
In: Nature Conservation in the Pacific: Proc. Symp. Nature Conservation in the Pacific, Canberra, 1971. Canberra, Australian National University Press, 1973. pp. 39-52, 28 refs.
See Abstract no. 1105.

† Division of Plant Industry

1110 WILSON, J.R. Influence of aerial environment, nitrogen supply, and ontogenetical changes on the chemical composition and digestibility of Panicum maximum Jacq. var. trichoglume Eyles.
Aust. J. agric. Res. 24(4):543-56, 30 refs. (1973)

Effect of aerial environment and nitrogen supply on the chemical composition and in vitro digestibility of a tropical grass was studied by comparing plants of P. maximum var. trichoglume grown in pots either outdoors or in a humidified glasshouse. Plants from the two environments were similar in their percentage content of protein and cell wall materials. Young tissue from the outdoor plants was more digestible than material from the glasshouse, but digestibility of this material was nevertheless very high in all plants. Thus, it appears that the unusually high nitrogen percentages and digestibilities which have been recorded for tropical grasses in laboratory studies by comparison with field-grown material may not be directly associated with differences in the aerial environment. This point remains to be conclusively tested under precisely controlled conditions. Increase in nitrogen supply from low to moderate levels increased digestibility by 3-5 percentage units, and had a small positive effect on the percentage of total soluble carbohydrates. Very high nitrogen supply lowered the soluble carbohydrate content of the plant tops. There was an inverse relation between tissue nitrogen concentration and the content of cell wall material. Amount of cell wall material increased progressively from the earlier- to the later-formed leaves on a tiller. When compared at a similar age, later-formed leaves tended to less digestible. This influence of leaf position on nutritive quality is very interesting and warrants further investigation.

DIVISION OF HORTICULTURAL RESEARCH

G. P. O. Box 350, Adelaide, S. Aust. 5001.

1111 POSSINGHAM, J. V. C. S. I. R. O. Division of Horticultural Research.
Aust. Grapegr. Winemaker no. 112:36-7, 39 (1973)

Apart from the grapevine the Division is becoming more interested in other perennial fruit crops with potential in irrigated inland areas of Australia. Current research on the grapevine includes breeding, clonal selection, virus studies, and nematode resistance of rootstocks. Other aspects include the forecasting of crop yields, mechanical harvesting, trellis design, and dried fruit processing. Horticultural crops being investigated include pistachios, avocados, chinese gooseberries, macadamias, lychees, guavas, mangoes and the Australian native quondong or native peach. Fundamental studies are being undertaken on the physiology and biochemistry of plants being investigated in the field.

Merbein Laboratory

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1112 MAGGS, D.H. Genetic resources in pistachio.
Pl. Genet. Resources Newsl. 29:7-15, 23 refs. (1973)

It is well known that many potentially interesting, but neglected, tree crops are to be found concentrated in areas described as centres of origin. As long as these centres remained undisturbed in their primitive condition the neglected species were more or less safe, preserved in their isolation. Such underdeveloped areas have now begun to be opened up and the process has reached a critical rate. New crops are being planted or, worse, over-grazing has left bare, unprotected ground. In both cases the result is the loss, now reaching catastrophic proportions, of genetic reserves for the development of new tree-crop varieties. One such crop is the pistachio. Long regarded as a minor luxury crop, the pistachio nut (Pistacia vera L.) is becoming recognized as an irrigation crop of high potential value for subtropical semi-deserts. This interest has led, somewhat belatedly, to the recognization that not only are there few identified varieties, but also that the principal sources of new germplasm are being rapidly eroded.

DIVISION OF IRRIGATION RESEARCH

Private Bag, Griffith, N.S.W. 2680.

1113 MOSS, G.I. Some recent technical developments in citrus culture.
Fmrs' Newsl. no. 119:5-8, 23 (1973)

The second International Citrus Symposium was held in Spain during May, 1973. Although no revolutionary techniques were presented, research has progressed in a number of fields relevant to Australian citrus culture including mechanical harvesting, culture methods, herbicides, irrigation and salinity, nutrition, and control of yield and quality.

DIVISION OF LAND USE RESEARCH

P. O. Box 1666, Canberra City, A.C.T. 2601.

Rangeland Research Unit

P. O. Box 1666, Canberra City, A.C.T. 2601.

1114 SHARMA, M. L. and TONGWAY, D. J. Plant induced soil salinity patterns in two saltbush (Atriplex spp.) communities. J. Range Mgmt 26(2):121-5, 9 refs. (1973)

A detailed examination was made into the soil salinity distribution of two Atriplex communities, A. vesicaria and A. nummularia, established at regular spacings on two soil types. The results based on total soluble salts and chlorides suggested that both saltbush species induced significantly higher salinity in the 0-15 cm soil horizon beneath the bush canopies compared to between the bushes, although A. nummularia induced significantly higher salinity than A. vesicaria on both the soils. The pH was also significantly increased under the bushes, but only for the 0-7.5 cm layer. A mechanism for plant-induced soil salinity is proposed by which distinct zones of salt depletion, accumulation and compensation are established. It is suggested that the accumulation of significantly large quantities of salt in the surface layer under the bushes occurred as a result of decomposition of large quantities of salt-rich leaves and fruits. This salt is mainly derived from the soil profile under the plant. Implications of the spatial variability in soil salinity are discussed.

DIVISION OF SOILS

Private Bag No. 1, Glen Osmond, S. Aust. 5064.

1115 BLACKBURN, G. Chaetal striations in burrows of Notoscolex shephardi Spencer. Victorian Nat. 90(7):188-9, 1 ref. (1973)

Under some conditions impressions of chetae on burrow walls are clearly preserved and may be useful in helping to identify worm burrows in soil. Observations of burrows of N. shephardi in gilgai clay soils from western Victoria are presented.

1116 HALLSWORTH, E. G. and ADAMS, W. A.* Heavy metal content of rainfall in the East Midlands. Environ. Pollut. 4:231-5, 2 refs. (1973)

Analyses of rainfall were made between March 1963 and March 1964 to determine whether irregularities in the growth of clover plants at the

University of Nottingham were due to contamination by fly-ash from power stations in the area. The disparity recorded between rainfall and contamination and the apparent dependence of the latter on seasonal factors, such as fog, suggested that the major contribution to the input was not airborne soil. The differing heavy metal content of the fly-ash and rainfall ash from the various sources is discussed, the copper and molybdenum content being found to be considerably higher at certain sites than at others. An unusually high level of lead was noted.

1117 MARTIN, J.K. and CUNNINGHAM, R.B. Factors controlling the release of phosphorus from decomposing wheat roots.
Aust. J. biol. Sci. 26(4):715-27, 21 refs. (1973)

An increase in incubation temperature from 5 to 45°C significantly ($P < 0.001$) increased the release of radioactivity into water solution from intact root systems severed from wheat plants labelled with ^{32}P. Sterile roots incubated at 45°C released >90% of total radioactivity into solution, mainly as orthophosphate, showing an extensive dephosphorylation of organic phosphorus components by plant enzymes. Factors favouring microbial growth around the dead roots caused a slight reduction in ^{32}P activity in solution. Air-drying at 20-40°C prior to incubation resulted in a rapid release of ^{32}P activity from the roots which was independent of the incubation temperature. It is concluded that root phosphorus can be released directly into soil solution, mainly as orthophosphate, as the result of autolysis and does not necessarily become incorporated into the organisms decomposing the roots. Amounts of phosphorus contained in different components of the total soil biomass were estimated and the conditions favouring release of this phosphorus into soil solution are discussed.

1118 MOSS, A.J. Initial fluviatile fragmentation of granitic quartz.
J. sedim. Petrol. 42(4):905-16, 12 refs. (1972)

Fragmentation loads, the loads under which individual particles fragment between plattens, were measured for quartz from weathered samples of a granite and from points along a stream system draining the granite surface. Stream transportation caused major destruction of 2-5mm quarts in a few kilometers, 1-2mm particles were less affected and breakage of 0.5-1.0mm quartz was more than compensated by production of new grains created by breakage of coarser ones. Most breakage probably occurs in the bedload zone during floods, particularly in the presence of moving pebbles. Greater mobility enables small grains to outlast larger, stronger ones in this environment. Not only are small grains more easily kept above the breakage zones in suspension but they are probably much more readily moved away from impending impact points between pebbles by momentary radiating currents generated around such points just before the pebbles impact. Downstream fining of river sediments is due to both hydraulic separation

and breakage. The latter is very important in headwater regions but its effectiveness probably wanes downstream in large rivers.

1119 SLEEMAN, J.R. and BREWER, R. Micro-structures of some Australian termite nests.
Pedobiologia 12(5):347-73, 10 refs. (1972)

Sixty thin-sections (6 x 5 cm) of parts of nests of 14 species of termites from 18 different sites have been examined and the materials classified on micromorphological data. Three classes of nest materials are distinguished on the basis of the proportion of organic and mineral material present. Within each of these, subclasses are distinguished on patterns of voids (other than galleries) and the occurrence of organic nodules and laminae, pellets, lenticular, lamellar, and crenulate fabrics and bow-structure. These morphological classes are related to species, feeding habit, part of nest, and location of nest. An attempt is made to interpret these various micro-structural features and fabrics in terms of building habits.

DIVISION OF ANIMAL GENETICS

P.O. Box 90, Epping, N.S.W. 2121.

1120 HAYMAN, R.H. and RADCLIFFE, J.C.* Dairy industry.
In: Alexander, G. and Williams, O.B. (eds.) Pastoral industries of Australia. Practice and technology of sheep and cattle production.
Sydney, Sydney University Press, 1973. pp. 171-98, 19 refs.

Characteristics of the industry in each Australian state are described. In recent years, a large fall in the number of dairy farmers, encouraged by the Marginal Dairy Farms Reconstruction Scheme, has been offset by better management and production in large herds. Milking techniques and farm labour are discussed. Except for bloat, disease is a comparatively small problem in this country; due mainly to strict quarantine regulations and availability of vaccines. Nutrients for most cows come from ad libitum grazing: close control of nutrition has limited application. Lactation pattern is matched to seasonal production of forage. Recording of milk and butterfat production is being integrated with artificial insemination and with breeding for beef. Utilization of whole milk and dairy products are described with activities of the Australian Dairy Produce Board, research, education and assistance to farmers. Among predictions for the future, it is suggested that the low labour and capital outputs are unlikely to change.

1121 LATTER, B.D.H. Selection for a threshold character in Drosophila. 4. Chromosomal analysis of plateaued populations. Genetics 73:497-512, 15 refs. (1973)

Chromosome substitution and intra-chromosomal recombination techniques have been employed to determine the genetic basis of limits to selection in lines selected for high scutellar bristle number from the Canberra population. Three observations indicate the presence of an upper threshold affecting some component traits, which is not readily discernible at the level of the selected phenotype: (1) the variance of the number of anterior + interstitial + posterior bristles is progressively reduced as the mean approaches a total of eight at these sites. Total bristle number, which includes apicals in addition to the above three components, and which was the trait subject to selection, shows little evidence of this phenomenon; (2) the effect of a given chromosome substitution is also greatly reduced as the mean approaches eight anterior + interstitial + posterior bristles, by comparison with its effect in genotypes of lower mean; (3) chromosome substitutions show some evidence of negative interaction as this level is approached, in contrast to the positive interactions evident at higher means. All chromosomes except IV are involved in progress beyond the proposed upper threshold. However, chromosome III has the most important effect, due primarily to a major gene located at approximately 61 cM, which also markedly increases dorsocentral and postvertical bristle numbers.

1122 PENNYCUIK, Pamela R. Behaviour of mice housed in groups at 4, 21 and 33°C.
Aust. J. biol. Sci. 26(4):917-26, 13 refs. (1973)

Grouped mice breed well in a warm environment but poorly in the cold. This could be the result of temperature-induced changes in behaviour. In order to test this, female mice were exposed to 4, 21 and 33°C in cages equipped with four box shelters arranged on either side of a narrow alley. Groups sizes of 2, 4, 8, 16, and 32 were examined and observations were made on the distribution of mice, wood-wool, food, faeces, and urine between the shelters and the outside world and between the four box shelters. Observations were also made on the number of mice which shared one territory. The number of mice and the amounts of wood-wool, food, etc., found in the shelter were high when temperature was low and low when temperature was high. This was true at all group sizes. In addition, temperature affected the usage of the shelter space available: at 33°C the mice used all four boxes for nesting, eating, defaecation, and urination: at 4 and 21°C one box was set aside as a nest box and the others were used for eating, defaecation, and urination. Temperature had no effect on the number of mice which shared one territory. Thus low temperatures increased the number of contacts between the individual and its companions and high temperature decreased them. It was concluded that behavioural differences could contribute to differences in the breeding capacity of grouped mice exposed to different temperature regimes.

1123 TURNER, Helen Newton. Genetic interactions between wool, meat and milk production in sheep.
Anim. Breed. Abstr. 40(4):621-34, 85 refs. (1972)

Three aspects of sheep production: wool, meat and milk, are defined, and the genetic relationships between their characteristics discussed. There are no strong negative genetic correlations to prevent selection of an animal for quantity of wool, meat and milk. Among wool, milk and one component of meat production (body weight), the correlations are generally zero or positive. Between body weight and the other component, reproduction rate (which is also of importance to all types of production), the correlation is again positive, while for wool weight and reproduction rate the position is not clear. Estimates of this last correlation vary, but selection for either wool weight or twinning rate in the Australian Merino has not so far led to a fall in the other characteristic. In view of the reporting of some negative estimates of the correlation, it would be unwise to neglect reproduction rate in any breeding plan to raise wool production. Few estimates of the genetic correlations between lamb growth rate and other characteristics were found. Bod, weight at a given age is a measure of grwoth rate to that age, but maximum efficiency in meat production is attained when a given body weight is reached in minimum time. Published work on milk quality is concerned mainly with problems of selection for milk production, and its genetic association with other products has barely been considered, except in relation to lamb growth rate. Among the quality characteristics of wool, average fibre diameter is most important. There are suggestions that negative genetic correlations with body weight and reproduction rate, and a positive correlation with wool weight, would need to be watched, but the correlations are mainly low in magnitude. The only estimate of genetic correlation between fibre diameter and reproduction rate is high, but more estimates are needed before firm conclusions can be drawn. These considerations, on relationships calculated for individual animals within a flock, indicate that wool, meat and milk can be produced together, though there are some correlations which cannot be overlooked in making selection plans. The need for simplification of breeding aims is stressed: desired characters should be defined in as few terms as possible for any production gain.

Cattle Breeding Laboratory

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1124 SCHLEGER, A. V. and BEAN, K. G. Melanocyte system of cattle skin. 1. Amelanotic dendritic cells of epidermis.
Aust. J. biol. Sci. 26(4):973-83, 39 refs. (1973)

Amelanotic dendritic cells of cattle skin were studied using the histochemical reactions for non-specific alkaline phosphates and specific cholinesterase.

These epidermal cells in cattle skin show no reaction for adenosine triphosphatase. Their distribution throughout the epidermis, hair follicle sheath, and glandular epithelia has been compared with that reported for other species. The difference between animals in pattern of amelanotic dendritic cells may be expressed as a score depending on number and size of cells and the length of the dendritic processes. This score has a good repeatability and heritability. The dendritic score varies inversely with the plane of nutrition. The cells are unaffected when the epidermis is depigmented with hydroquinone. On the other hand they are virtually disappear when pigmentation is increased by the joint application of progesterone and oestrogen. Complexity of the amelanotic dendritic cell pattern of cattle skin varies inversely with (1) keratinocyte activity as expressed in hair growth phase or coat type, a reflection of follicle activity; and (2) the production of melanin which might vary between different hair growth phases, between different body regions of the one animal, between animals subject to the same treatment, between different levels of nutrition, or in response to topically applied hormones.

1125 SCHLEGER, A. V. and BEAN, K. G. Melanocyte system of cattle skin. 2. Melanotic melanocytes of epidermis and dermis. Aust. J. biol. Sci. 26(4):985-97, 49 refs. (1973)

Distribution of melanotic melanocytes was studied throughout the epidermis and dermis of cattle skin. Characteristic differences occur between animals according to pattern of epidermal amelanotic dendritic cells and there is a marked contrast between pigmented and non-pigmented areas of the one animal. The two major types of melanocyte observed in mice are apparent in cattle epidermis and epidermal melanocyte morphology appears to be related to size and distribution of dopa-positive dermal cells. Active melanocytes, as indicated by the presence of peroxidase, have been demonstrated in all layers of the skin. Melanophages, rich in acid phosphatase, are more pronounced in the subepidermal portion of the dermal layer. The melanocyte system is highly sensitive to external stimuli. Melanogenic response to surgical biopsy, parasitic exposure, and the topical application of agents increasing or decreasing pigment formation has been investigated. It is postulated that the melanocyte system might have an important surveillance role in the defence mechanisms of the skin.

1126 SLEBECK, R. M. Effect of body-weight loss on the composition of Brahman cross and Africander cross steers. 2. Dissected components of the dressed carcass.
J. agric. Sci., Camb. 80(Pt 3):411-23. 14 refs. (1973)

Comparative slaughter was used to assess the effects of body-weight loss (BWL) on Brahman cross (BX) and Africander cross (AX) steers of the F_3 generation with respect to gross dissected carcass composition and the distribution of these components over the dressed carcass. Animals were

slaughtered at design body-weights of 325, 341, 358, 374 and 390 kg, some while during positive body-weight growth (Group A), and others during BWL from 390 kg at a rate of approximately 0.5 kg/day (Group B). Gross composition was similar in the two breeds, irrespective of the BWL treatment. BWL resulted in muscle and fat approximately reversing the path of development, while bone and fascia and tendon remained approximately constant. No evidence of proportionally early loss of fat and later loss of muscle was found. Of the fat components, kidney and channel fat showed the highest relative loss. The distribution of muscle was different between the breeds, the most statistically significant differences being that AX had heavier muscles around the spinal column and lighter shin muscles, at the same total muscle weight. Bone weight distribution differences also occurred, with AX tending to have lighter leg bones, at the same total bone weight. A breed difference in intermuscular fat distribution meant that the AX animals were earlier developing in the forequarter and later developing in the hind quarter in respect to its intermuscular fat, than the BX animals. BWL affected muscle-weight distribution, the most marked effect being that the relevant proportion of abdominal muscles fell during BWL. Bone-weight distribution was affected to a minor extent, the effects mainly being in the leg bones rather than the axial skeleton. The distribution of neither fascia and tendons nor subcutaneous fat was affected by the BWL treatment, but the distribution of intermuscular fat was affected.

DIVISION OF ANIMAL HEALTH

Private Bag No. 1, Parkville, Vic. 3052.

1127 ALTON, G.G. Brucellosis in goats and sheep.
Wld Anim. Rev. no. 5:16-20, 9 refs. (1973)

In terms of suffering, brucellosis is considered the most important human disease contracted from animals. A true zoonosis, it is caused by Brucella spp., most frequently B. melitensis. History, distribution, effects of the disease on ruminants, economic and public health factors, and control measures are discussed.

1128 ANDERSON, N. Trichostrongylid infections of sheep in a winter rainfall region. 2. Epizootiological studies in the western district of Victoria, 1967-8.
Aust. J. agric. Res. 24(4):599-611, 7 refs. (1973)

Mean counts of Ostertagia circumcincta and Trichostrongylus spp. from groups of "tracer" sheep ranged between 220 and 2,150 per fortnight between June and October and were less than 100 per fortnight from November to February inclusive. O. circumcincta was more numerous than Trichostrongylus spp. The relatively low numbers of available larvae were attributed to the dry weather conditions in autumn which did not favour

development and survival of the free-living stages. Between May and December 1967, worm numbers increased linearly in weaner sheep to reach mean levels of 14,000 without any detectable resistance to reinfection or significant decrease in liveweight gain or wool production. Correlations between mean plasma pepsinogen concentrations from weaner and adult sheep and "tracer" worm burdens were significantly different: r = 0.37 and 0.47 for weaners and r = 0.8 for adult sheep. Thus the relationship between larval intake and abomasal damage as reflected by plasma pepsinogen concentrations is not a simple one. Mucosal damage is probably preceeded by a hypersensitive state. Anthelmintic treatment, given in October and January, reduced the worm egg output of treated sheep to one-tenth that of untreated sheep for a period of 18 weeks between October and March.

1129 McLEAY, L. M.*, ANDERSON, N., BINGLEY, J. B. and TITCHEN, D. A.* Effects on abomasal function of Ostertagia circumcincta infections in sheep.
Parasitology 66:241-57, 32 refs. (1973)

Sheep in which abomasal fundic pouches had been made were infected with O. circumcincta (150,000 larvae in one sheep, 100,000 in three sheep). Subsequently studies were made on pouch secretion, food intake, plasma pepsinogens and abomasal pouch secretory responses when the sheep first ate. A functional abomasal lesion was apparent within four days of infection judged by the changes in plasma pepsinogen levels and the Na concentrations of abomasal contents. Whereas the secretory activity of the abomasal fundic pouches (never exposed to parasites) was maintained or increased, the pH and Na concentration of contents taken from the infected part of the abomasum were indicative of either a failure to secrete or of a permeability reabsorptive lesion. Ultrastructural studies demonstrated that parietal cells of the pouches had the appearance of cells subjected to strong secretory stimuli, but those of infected abomasa were similar to cells of gastric mucosa subjected to agents suppressing secretion. Factors which might operate, on the one hand, to stimulate secretion from separated fundic abomasal pouches, and on the other to inhibit or modify the secretory activity of the fundic mucosa of the infected abomasa, are discussed.

DIVISION OF ANIMAL PHYSIOLOGY

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1130 ALEXANDER, G. and WILLIAMS, O. B. Pastoral industries of Australia. Practice and technology of sheep and cattle production.
Sydney, Sydney University Press, 1973. 567 p.

1131 BASSETT, J. M. and THORBURN, G. D. Circulating levels of progesterone and corticosteroids in the pregnant ewe and its foetus.
In: Proc. Int. Symp. Endocrinology of pregnancy and parturition - experimental studies in the sheep, Cardiff, 1971. Cardiff, Alpha Omega Alpha Publishing, 1973. pp. 126-40, 44 refs.
Observations made on the changes during pregnancy in the peripheral plasma concentrations of progesterone in the ewe and of corticosteriods in the foetus are considered and an attempt is made to relate these observations to current ideas on the role of these hormones in pregnancy and in the initiation of parturition.

1132 BRADEN, A. W. H. and BAKER, A. A. * Reproduction in sheep and cattle.
In: Alexander, G. and Williams, O. B. (eds.) Pastoral industries of Australia. Practice and technology of sheep and cattle production. Sydney, Sydney University Press, 1973. pp. 269-302, 209 refs.
Reproductive performance of cattle and sheep is generally low in Australia, and to some extent reflects the harsh environment. An account is given of research results in reproductive physiology of sheep and cattle. Although industrial applications of research are usually slow, the intensive experimentation with sheep and the cost-price influence are showing practical effects. Genetic investigations indicate that heritability of fertility is extremely low. Environmental control of this feature is particularly important in northern Australia, where strategic weaning of calves and preferential feeding of breeding cows can improve reproductive efficiency to levels comparable with those in temperate regions. Here, percentages can be raised by controlling nutrition and diseases, by culling infertile animals and using efficient records of individual reproductive histories. Manipulation of the oestrous cycle is being attempted to make full use of artificial insemination and twinning induction.

1133 BROWN, G. D. and HUTCHINSON, J. C. D. Climate and animal production.
In: Alexander, G. and Williams, O. B. (eds.) Pastoral industries of Australia. Practice and technology of sheep and cattle production. Sydney, Sydney University Press, 1973. pp. 336-70, 172 refs.
Since adverse effects of the Australian climate can rarely be alleviated, much research has been directed towards selection of ruminants adapted to the environment. Identification of suitable genotypes and selective breeding programmes have been facilitated by physiological research on environmental effects and adaptation. The association of climate with productivity is due partly to its effect on feed availability and partly to direct effects. The

influences of hot and cold climates on cattle, sheep and buffaloes are discussed, with an outline of research results on summit metabolism, temperature regulation, water relations and protection of animals from adverse climates. It is often difficult to relate indoor experimental results to pastoral conditions, but radiotelemetric techniques are being developed to facilitate field measurement of physiological reactions.

1134 CARRICK, F.N.* and COX, R.I. Testosterone concentrations in the spermatic vein plasma of marsupials.
J. Reprod. Fert. 32:338-9, 3 refs. (1973)

Testosterone has been isolated from the blood plasma from testicular veins of several marsupial species (Trichosurus vulpecula, Parameles nasuta, Macropus robustus and Megaleia rufa) and the platypus (Ornithorynchus anatinus). Only minute quantities < 1 ng/ml were isolated from the plasma from Pseudocheirus perigrinus. It appears that the amount of testosterone in spermatic vein plasma from T. vulpecula varies seasonally and is related to alternations in the size of the prostatic complex.

1135 CHAPMAN, R.E., WILLIAMS, O.B. and MOULE, G.R.* Wool industry.
In: Alexander, G. and Williams, O.B. (eds.) Pastoral industries of Australia. Practice and technology of sheep and cattle production. Sydney, Sydney University Press, 1973. pp. 79-116, 130 refs.

Much of the information in this chapter on type of property, wool growing regions and production statistics is derived from the Australian Sheep Industry Survey (Bureau of Agricultural Economics). Other aspects include the breeds, ownership, labour and capital involved in wool production. The yearly cycle of management operations is described with the genetic and environmental influences on production. An account of wool fibre characteristics, local and export marketing, of organizations concerned with the industry, promotion, research and education, and government assistance to growers and those organizations is followed by discussion on the status and viability of the industry.

1136 FAICHNEY, G.J. and LLOYD DAVIES, H.* Performance of calves given concentrate diets treated with formaldehyde.
Aust. J. agric. Res. 24(4):613-21, 20 refs. (1973)

Five groups of Friesian bull calves were given concentrate diets containing 70% barley in which low (12%), medium (15%), and high (19%) protein levels were obtained by varying the amount of peanut meal included. Effects of protein level and of formaldehyde treatment of the complete diet at the low and medium protein levels were studied in terms of liveweight gain, voluntary food consumption, digestibility of the diet, ammonia nitrogen in rumen fluid, and urea and α-amino nitrogen in blood plasma. Observations were begun when the calves reached 70 kg liveweight and continued until

they reached 130 kg liveweight. The calves given low protein diets grew more slowly than those given the higher protein diets. The calves given the high protein diet grew no better than those given the medium protein diets. Formaldehyde treatment was associated with an increase in the rate of liveweight gain of 9% (P=0.11) at the low protein level but had practically no effect at the medium protein level. The treatment did not adversely affect voluntary food consumption but was associated with decreases in the digestibility of nitrogen and in rumen ammonia levels and small increases in plasma urea levels.

1137 HEMSLEY, J.A., REIS, P.J. and DOWNES, A.M. Influence of various formaldehyde treatments on the nutritional value of casein for wool growth.
Aust. J. biol. Sci. 26(4):961-72, 32 refs. (1973)

Formaldehyde-treated casein was prepared by either soaking casein in dilute aqueous formaldehyde followed by washing and drying, or by mixing casein with small volumes of more concentrated formaldehyde solutions and allowing unreacted formaldehyde to remain in the product. The effectiveness of treatment was assessed by measurements of the amount of formaldehyde bound to casein and the resistance of the casein to degradation by rumen micro organisms in vitro. The utilization of the casein preparations by sheep was assessed by measurements of nitrogen digestibility, rate of wool growth, and wool fibre diameter. The rate and extent of reaction of formaldehyde with casein depended on the duration of the reaction, the concentration of the formaldehyde solution, and the ratio of solution : casein. The extent of binding increased with formaldehyde concentration and was greater with a small volume of concentrated solution than with a larger volume of less concentrated solution containing the same amount of formaldehyde. Amounts of bound formaldehyde up to 3.8 g/100 g dry product were obtained. Untreated casein was readily degraded to ammonia by rumen micro organisms in vitro. Dietary supplements of untreated casein were almost completely digested but produced only slight increases in wool growth rate. Formaldehyde-treated casein which contained 0.5-1.5% bound formaldehyde increased wool growth rate and fibre diameter substantially when included in the diet. The greatest wool growth response was obtained with casein preparations containing about 1% bound formaldehyde, regardless of the treatment procedure. Casein containing amounts of bound formaldehyde outside the range 0.5-1.5% was of little value for wool growth. The preparations that were most effective in stimulating wool growth corresponded to treatments that afforded good protection in vitro without producing an appreciable reduction in digestibility. Ineffective casein preparations were either incompletely protected in the rumen or had a lowered digestibility. Casein could be rendered virtually indigestible by excessive treatment with formaldehyde.

1138 HOGAN, J.P. Intestinal digestion of subterranean clover by sheep.
Aust. J. agric. Res. 24(4):587-98, 44 refs. (1973)

Quantitative studies have been made of digestion in the small and large intestines of sheep offered a diet of Trifolium subterraneum c.v. Clare at levels approaching ad libitum. As in previous studies with a similar diet, most of the digestion of organic matter and of cell wall constituents occurred in the stomach; by contrast, the release of long-chain fatty acids and amino acids mainly occurred in the intestines. Although two-thirds of the dietary long-chain fatty acids were C 18 : 2 and C 18 : 3, hydrogenation in the rumen reduced their proportion to less than 20% in the digesta leaving the stomach. Amounts of long-chain fatty acids that passed from the stomach were equivalent to about 127% of intake. Approximately 70% of these were removed from the digestive tract subsequently, and most of the absorption occurred in the small intestine. Total amounts of these fatty acids absorbed from the intestines were equivalent to approximately 90% of the amount consumed, even though their apparent digestibility in the whole tract was only 61%. Most of the nitrogen that passed from the stomach was in the form of amino acids. Of the 189 g amino acids, less than one-third reached the terminal ileum. Net losses of individual amino acids in the small intestine ranged from 66% to 84% of the amounts that passed from the stomach. It was estimated that ca. one-third of the organic matter and almost 60% of the nitrogen passed from the stomach was present in bacterial cells. A major component of bacterial cell walls, diaminopimelic acid, was apparently not absorbed from the small intestine, though appreciable amounts of it were lost in the large intestine.

1139 MILLS, S.C. and COOK, L.J. Stereospecific analyses of ruminant triglycerides containing low and high proportions of linoleic acid.
Proc. Aust. Biochem. Soc. 6:33, 3 refs. (1973)

Abstract of paper presented at the 17th Annual Meeting of the Australian Biochemical Society, Canberra, 21-24 May, 1973.

1140 RESTALL, B.J., HEARNSHAW, H.R.*, GLEESON, A.R.* and THORBURN, G.D. Observations on the luteolytic action of prostaglandin $F_{2\alpha}$ in the ewe.
J. Reprod. Fert. 32:325-6 (1973)

Experiments indicate that close apposition of the uterine vein and ovarian artery is not essential for prostaglandin $F_{2\alpha}$ to act as a luteolysin, and the dose levels used (67 to 80 μg/hr) it does not act through the systemic circulation. Preliminary evidence suggests that the sympathetic nervous system may be involved.

1141 SHUTT, D.A. and COX, R.I. Competitive protein-binding assay of estrone, estradiol-17β or estradiol-17α in human or ruminant plasma.
Steroids 21(4):565-82, 37 refs. (1973)

A procedure for the assay of oestrone, oestradiol-17β or oestradiol-17α in plasma is described. The technique also appears applicable to the assay of oestriol in plasma. The procedure uses a semi-automatic extraction of plasma, rapid micro-alumina column chromatography and competitive binding of the oestrogens to stable proteins of sheep uterine cytosol. The use of alumina column chromatography results in consistently low blanks. The assay has been evaluated for the measurement of oestradiol-17β in human and sheep plasma, and for oestradiol-17α and oestrone in goat plasma. The change in binding affinity of oestradiol-17α relative to oestradiol-17β when incubated in sheep uterine cytosol at two different temperatures (25°C and 4°C), makes it possible to differentiate the two epimers of oestradiol. Measurement of oestradiol-17β down to 10 pg and of oestrone and oestradiol-17α to 25 pg are maintained in routine analyses. The specificity of the procedure was thoroughly checked by various methods, including comparison with spectrophotofluorimetric analysis.

1142 WESTON, R.H. and HOGAN, J.P. Nutrition of herbage-fed ruminants.
In: Alexander, G. and Williams, O.B. (eds.) Pastoral industries of Australia. Practice and technology of sheep and cattle production. Sydney, Sydney University Press, 1973. pp. 233-68, 50 refs.

Dependence of domestic ruminants on grazing with its seasonal variations often leads to nutritional deficiencies, although the ruminal population of micro organisms confers digestive complexities beyond those typical of animal metabolism. Nutrient deficiency usually occurs in mature forage resistant to ruminal degradation: supplementation may lead to only small improvements in production. Low fibre forages and concentrates can increase meat and milk levels, while wool growth can be improved by protecting harvested feeds with formaldehyde to delay breakdown of ingested sulphur amino acids. Techniques to prevent ruminal hydrogenation of fatty acids (which then become accessible in the intestine) can raise the poly-unsaturated fatty acid content of ruminant lipids. In spite of these manipulations it is expected that most livestock will continue to harvest their own herbage; thus management is based on broad knowledge of nutrient requirements for each form of production combined with the economics of improving the primary limiting factor. Integration of nutritional supply and demand is outlined in context of pastoral situation.

1143 WILLIAMS, O. B. Environment.
In: Alexander, G. and Williams, O. B. (eds.) Pastoral industries of Australia. Practice and technology of sheep and cattle production. Sydney, Sydney University Press, 1973. pp. 3-39, 71 refs.

Physical and biological components of the Australian environment that form an essential part of pastoral production include climate, soils, vegetation, fauna and their interactions. It is shown that areas with dependable feed supply for domestic animals are restricted. Inland animal production particularly, is at risk for extended periods. Irregularities within seasonal pasture growth are more limiting than the recurrent seasonal feed shortages. To some extent, fertilizers and improved forage species wit.. deep soils can buffer the system against short rainless periods. Despite increasing knowledge of environmental factors, except for a small elite, the rural communities controlling sheep and cattle production traditionally have a low educational status compared with non-rural industries.

1144 WILLIS, Marion and SCOTT, T. W. Incorporation of dietary linoleate into the serum lipoproteins of ruminants.
Proc. Aust. Biochem. Soc. 6:38, 1 ref. (1973)

Abstract of paper presented at the 17th Annual Meeting of the Australian Biochemical Society, Canberra, 21-24 May, 1973.

1145 WONG, M. S. F. and COX, R. I. Pathways of oestrogen biosynthesis in the sheep foeto-placental unit.
Proc. Aust. Biochem. Soc. 6:39, 2 refs. (1973)

Abstract of paper presented at the 17th Annual Meeting of the Australian Biochemical Society, Canberra, 21-24 May, 1973.

Pastoral Research Laboratory

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1146 WHEELER, J. L., HUTCHINSON, K. J. and LANGLANDS, J. P. Production and utilization of food for ruminants.
In: Alexander, G. and Williams, O. B. (eds.) Pastoral industries of Australia. Practice and technology of sheep and cattle production. Sydney, Sydney University Press, 1973. pp. 201-32, 129 refs.

In Australia, few beef cattle and no sheep are lot-fed; most dairy herds also rely heavily on pasture. This chapter is primarily a description of the various grazing regions and their production characteristics. Areas with meagre rainfall will never provide sustained feed supplies; native pastures with moderate to high rainfalls will continue as the significant grazing country, especially since there are indications of support for research to increase production without replacement by sown species.

Legumes will continue to be the key to pasture development. Forage crops, supplements and feed grains are evaluated, the latter being of importance in times of drought and during occasional excess wheat supply. Interactions between quantity of pasture produced, quality and quantity of feed consumed, and the productive and reproductive abilities of grazing animals are discussed, since stocking rate is the most powerful form of manipulation.

DIVISION OF NUTRITIONAL BIOCHEMISTRY

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1147 TOMAS, F. M. Parotid salivary secretion in sheep: its measurement and influence on phosphorus in rumen fluid. Q. Jl exp. Physiol. 58:131-8, 10 refs. (1973)

Establishment and maintenance of permanent parotid duct fistulas in sheep is described. With appropriate cannulation of the fistulas the saliva flow can be measured and sampled at successive points in time over long periods without the loss of saliva to the sheep. When saliva flow rate is not being determined the saliva flows directly to the mouth via a 'closed loop'. By this means saliva flow was measured periodically over 3-12 months in nine sheep receiving a variety of treatments. Saliva flow rates varied from 3 to 10 l/day and were reproducible within sheep. The surgical procedure is simple and sheep can be held in ordinary pens when saliva flow rate determinations are not required. Data relating to the influence of parotid saliva on the rumen fluid phosphorus concentrations by use of the described technique are presented and discussed. Inorganic phosphorus concentrations in rumen fluid are determined principally by the salivary phosphorus secretion.

DIVISION OF ENTOMOLOGY

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1148 ATKINSON, P. W., BROWN, W. V. and GILBY, A. R. Autoxidation of insect cuticular lipids: stabilization of alkyl dienes by 3, 4-dihydricphenols. Insect Biochem. 3(9):103-12, 18 refs. (1973)

Lipids from oöthecae of Periplaneta americana contain hydrocarbons and alkyl glycerides. As in exuviae, the hydrocarbons consist predominantly of cis, cis-6,9-heptacosadiene, together with 3-methylpentacosane and other saturated compounds. In air, extracted cis, cis-6,9-heptacosadiene decomposes, whereas it is stable on the cuticle. Comparative studies by gas chromatography and ultra-violet spectroscopy show that cis, cis-6,9-heptacosadiene and methyl linoleate are autoxidized by similar free-radical

mechanisms. Aqueous extracts of cuticle inhibit the autoxidation. Several 3,4-dihydricphenols present in cuticles are very effective inhibitors. The stability of lipids on cuticle is attributed to the presence of compounds which contain the 3,4-dihydricphenol moiety.

1149 FLETCHER, B. S. and GIANNAKAKIS, A. * Factors limiting the response of females of the Queensland fruit fly, Dacus tryoni, to the sex pheromone of the male.
J. Insect Physiol. 19:1147-55, 18 refs. (1973)

Factors limiting the responsiveness of female D. tryoni to the male sex pheromone were determined in laboratory bioassays. Maximum response occurred in bioassays carried out at the normal time of dusk under a light intensity of 0.8 ln/ft^2. The responsiveness of females decreased at light intensities above or below this value. Responsiveness was also influenced by an internal rhythm, the peak of which was synchronized with the start of dusk. The majority of females did not become responsive until their ovaries had matured and they all became unresponsive again for a period after mating. Four weeks after the first mating some females had regained their responsiveness.

1150 KEY, K. H. L. and BALDERSON, J. Distributional relations of two species of Psednura (Orthoptera : Pyrgomorphidae) in the Evans Head area of New South Wales.
Aust. J. Zool. 20(4):411-22, 6 refs. (1972)

The distribution of P. pedestris and the northern race of P. musgravei was studied in relation to habitat in the heathy vegetation of the sandy coastal plain near Evans Head, N.S.W. The density of both species was in general very low, corresponding to an average of only one specimen captured/man-hr; in a few patches it rose to several times that figure. The distribution of the two species was in the main mutually exclusive in a mosaic pattern reflecting the mosaic distribution of the respective preferred habitats, P. pedestris occurring on the margins of swamps and P. musgravei on somewhat better drained sites. At three locations mixed populations were found in the ecotone between the two habitats. At one of these, which was studied in detail, the zone of overlap was never wider than 12 m, and the highest density of each species occurred within a 2 m strip on either side of a median line related to a prominent habitat feature. The situation is compared and contrasted with that in parapatric species and races of morabine grasshoppers.

1151 MACKERRAS, I. M. and MARKS, Elizabeth N. * Bancrofts: a century of scientific endeavour.
Proc. R. Soc. Qd 84(1):1-34, 18 refs. (1973)

Joseph Bancroft M. D. arrived in Brisbane in 1864 where he practised medicine until his death in 1894. His son Thomas Lane Bancroft M. B. (d. 1933) practised medicine in various parts of Queensland. T. L. Bancroft's

daughter Josephine (d. 1971), a graduate in science and medicine, was a professional scientist whose last paper was published in 1970. All three served as Councillors of the Royal Society of Queensland, and were Honorary Life Members of the Society. This family made a remarkable contribution to Australian science. Between 1866 and 1970 they published 232 papers ranging over such diverse fields as public health, insect-borne diseases and parasitology of man and domestic and native animals, insect taxonomy and biology, fish biology, animal and plant poisons, and plant acclimatization, hybridization and diseases.

1152 RIEK, E. F. Phylogeny of the Parastacidae (Crustacea : Astacoidea), and description of a new genus of Australian freshwater crayfishes.
Aust. J. Zool. 20(4):369-89, 80 refs. (1972)

The development of the cephalothoracic grooves, orientation of the chelae in life (correlated with burrowing), and modifications of the sexual characters of the males are the main attributes utilized in deducing the probable phylogeny of the Parastacidae. Geocharax, in which the cephalothoracic grooves are separated and clearly defined, the chelae are orientated in oblique planes, and the male genitalia are simple, is considered to be the most plesiomorphic genus: the species, which are only moderate burrowers, occur in the Bass Strait Basin of south-eastern Australia. The Parastacidae are considered to have originated in this area of Aust., and to have dispersed from there to the other present-day extra-Australian regions of the southern hemisphere, each of the four extra-Australian genera being the apomorphic sister-group of a genus occurring in this Australian subregion. The new genus Gramastacus, with two included new species, is characterized by the extraordinary large genital papillae of the male, and the enlarged pleura of the second abdominal segment of the female. The cephalothoracic grooves and lines are clearly defined and almost as well developed as in Geocharax.

1153 TEAKLE, D. S.* and GRYLLS, N. E. Four strains of sugar-cane mosaic virus infecting cereals and other grasses in Australia.
Aust. J. agric. Res. 24(4):465-77, 20 refs. (1973)

Viruses of the sugar-cane mosaic virus (SCMV)-type were isolated from 23 naturally infected species of Gramineae in Qld, N.S.W., or N.T. The virus isolates were placed in four groups or strains on the basis of host reactions. Each strain was named after an important perennial host, viz. (1) Johnson grass (Sorghum halepense), (2) sugar-cane (Saccharum officinarum), (3) sabi grass (Urochloa mosambicensis) and (4) Queensland blue couch grass (Digitaria didactyla). The strains could be distinguished on the basis of mosaic or necrotic reactions in Yates NK220Y and Atlas sorghums, on ability to cause systemic infection of Johnson grass or sugar-cane, or local infection of French bean (Phaseolus vulgaris cv. Bountiful). This ability of the sabi grass strain to infect a dictyledonous host is

previously unreported for any strain of SCMV. All four virus strains had a normal particle length of 736 ± 17 nm, but the variability in particle length was greater for the sugar-cane and Queensland blue couch grass strains than for the other two. The Johnson grass strain was only distantly serologically related to the sugar-cane, sabi grass, and Queensland blue couch strains, but the latter three were very closely related amongst themselves. Five aphid species, Aphis craccivora, A. gossypii, Macrosiphum euphorbiae, Rhopalosiphum maidis, and R. padi were shown to transmit at least one strain of SCMV. A. craccivora and R. maidis were each able to transmit all four strains. The Johnson grass strain of SCMV is the major strain infecting maize and sorghum crops in Australia. It was probably the cause of the maize ringspot mottle disease first observed in 1948 and of the mosaic and necrotic diseases of Sorghum almum first observed in 1960. These early records and its distinctive host reactions and serological properties make it unlikely that it is a recent introduction to Australia.

1154 WATSON, J. A. L. and KISTNER, D. H.* Glandular anatomy and biology of the termitophilous Australian aleocharine, Drepanoxenus (Coleoptera : Staphylinidae).
Aust. J. Zool. 20(4):341-58, 19 refs. (1972)

The major integumental glands of larval and adult Drepanoxenus, and aspects of behaviour and life history, are described, and related to the degree of integration of the inquilines into the communities of Drepanotermes, the host termites. The glandular systems are highly specialized, particularly in the adults, a phenomenon common in highly integrated inquilines. The termites accept the larval inquilines readily, and appear also to accept and feed the adults. The beetles are apparently long-lived, but there is a period of high mortality in the pupation chambers, or at the time that the adults disperse, so that only small numbers survive. The annual cycle of inquiline activity parallels that of the hosts, with the highest frequencies of infested nests, and of all three larval instars, occurring in the summer.

DIVISION OF WILDLIFE RESEARCH

P. O. Box 84, Lyneham, A.C.T. 2602.

1155 DUNSMORE, J. D. and PRICE, W. J. Non-winter epizootic of myxomatosis in subalpine south-eastern Australia.
Aust. J. Zool. 20(4):405-9, 7 refs. (1972)

A myxomatosis epizootic, that occurred in Feb.-April 1972 in a rabbit population in which a winter epizootic was observed in 1969, is described. Rabbit fleas had been introduced into the rabbit population in the intervening period. In the 1972 outbreak the case mortality was only 33% compared with 86% in 1969. The difference is thought to be related to the colder conditions

during the 1969 epizootic. The morbidity rate rate could not be accurately measured in 1972 but was a minimum of 65%. It is believed that in the 1972 epizootic the virus was transmitted by rabbit fleas. It appears that any change in the epidemiological pattern of myxomatosis towards summer epizootics in areas in which they have previously occurred in winter will drastically reduce the rabbit mortality currently caused by myxomatosis. The introduction of rabbit fleas may increase the likelihood of epizootics in summer and autumn.

1156 NEWSOME, A. E. Adequacy and limitations of flora conservation for fauna conservation in Australia and New Zealand. In: Nature Conservation in the Pacific: Proc. Symp. Nature Conservation in the Pacific, Canberra, 1971. Canberra, Australian National University Press, 1973. pp. 93-110, 44 refs.

It is now obvious that farming and grazing, and the maintenance of natural bushland in Australia are incompatible forms of land use. To remove an animal's habitat is to ensure its demise. The best way to prevent degradation of habitats is by creating nature reserves. The equivalent of 9.3% of the total land in N. Z. is preserved cf. only 2.4% in Aust. To match New Zealand's performance, Australia needs to double its effort and more. Knowledge of the distribution of the fauna and its ecology is essential for its proper conservation. In Australia, as in other countries, there is a need for improved legislation concerning the use of land and its resources, in which nature conservation and environmental protection are accorded the same status as the more traditional economic uses for mining and agriculture.

1157 SCHODDE, R. General problems of fauna conservation in relation to the conservation of vegetation in New Guinea. In: Nature Conservation in the Pacific: Proc. Symp. Nature Conservation in the Pacific, Canberra, 1971. Canberra, Australian National University Press, 1973. pp. 123-44, 29 refs.

Distribution patterns of the New Guinean fauna are analysed in relation to vegetation distribution and other environmental factors. Those sections of the biota that can be expected to contain the fullest possible representation of the island's forms of life are delimited for conservation. Those habitats that are being alienated and the degree of alienation are identified. Some possible corrective measures are indicated.

1158 VAN TETS, G. F. Seabirds.
In: Nature Conservation in the Pacific: Proc. Symp. Nature Conservation in the Pacific, Canberra, 1971. Canberra, Australian National University Press, 1973. pp. 179-80.
Some of the threats to Pacific sea birds outlined included those due to the human population explosion and the dwindling environmental resources.

1159 WILLIAMS, R. T. and PARER, I. Status of myxomatosis at Urana, New South Wales, from 1968 until 1971.
Aust. J. Zool. 20(4):391-404, 14 refs. (1972)
Epizootics of myxomatosis which occurred each year from 1968 until 1971 in a rabbit population inhabiting a 700-acre study site at Urana, N.S.W., were studied. Transmission was rapid in 1968 and 1969, Anopheles annulipes being the vector, and the peak of these epizootics occurred in early Nov. Transmission in 1970 was primarily by the flea Spilopsyllus cuniculi, and was slower, but the midpoint of the epizootic still occurred in early Nov. In 1971 the epizootic peaked in late Dec., transmission was rapid and the vector was unknown. Each year, about 75% of the susceptible animals older than 3 months of age at the time of the epizootic contracted myxomatosis: of these, 60% recovered, and of the recoveries, 20% died between the time of recovery (early Dec.) and 1 Jan. Fewer animals (16-55%) under 3 months of age were seen with myxomatosis; of these, about 50% were seen to recover, and a large proportion (from 25 to 45%) of animals seen to recover died before 1 Jan each year. The great majority of animals not seen to contract myxomatosis probably died from other causes without being exposed to the disease. These data indicate that myxomatosis killed very few animals directly during these epizootics, and that other factors were responsible for the majority of deaths which occurred during the epizootic period. In 1968, 1969, and 1970, reactivation of latent virus in animals which had previously recovered from myxomatosis was probably the source of the virus which initiated the epizootics.

DIVISION OF FISHERIES AND OCEANOGRAPHY

P. O. Box 21, Cronulla, N.S.W. 2230.

1160 HAMOND, R. Harpacticoid copepods (Crustacea) of the saline lakes in southeast Australia, with special reference to the Laophontidae.
Rec. Aust. Mus. 28(17):393-420, 17 refs. (1973)
Bottom-living copepods collected in the saline lakes include the cyclopoid Halicyclops ambiguus Kiefer and six species of the harpacticoid, namely Mesochra baylyi Hamond, Onychocamptus bengalensis (Sewell), Cletocamptus deitersi (Richard), Heterolaophonte wellsi sp. nov., Robertsonia propinqua

(Scott), and an undescribed species of Amphiascoides. M. baylyi was by far the most widespread and numerous harpacticoid, and in many of the samples it was the only harpacticoid present. O. bengalensis was the second numerous and widespread harpacticoid, the other harpacticoids all being scarce; H. ambiguus was about as common as O. bengalensis, and had a substantially similar distribution. R propinqua, O. bengalensis and C. deitersi are new records for Australia. H. wellsi has been found only in high-salinity localities lacking weeds, and therefore appears to favour the bottom sediments; none of the other species showed any distinct preference for localities with or without weeds. A description of H. wellsi, a redescription of O. bengalensis, and notes on C. deitersi are presented.

DIVISION OF FOOD RESEARCH

P. O. Box 52, North Ryde, N.S.W. 2113.

1161 BISHOP, D. G. Inhibition of photochemical activity in chloroplasts by the polyene antibiotic, filipin.
Archs Biochem. Biophys. 154(2):520-6, 29 refs. (1973)

The polyene antibiotic filipin inhibits the activities of both Photosystem I and Photosystem II in maize mesophyll chloroplasts and pea chloroplasts. Maximum inhibition of Photosystem II activity was observed at a filipin concentration of about 0.4 mM in maize mesophyll chloroplasts and 1.0 mM in pea chloroplasts. Inhibition of Photosystem II activity was temperature dependent, being much less if the antibiotic and chloroplasts were incubated at 0°C compared to 25°C. The inhibition of Photosystem I activity of both maize mesophyll and pea chloroplasts caused by filipin, could be overcome by the addition of the soluble electron transfer protein, plastocyanin. It is concluded that the inhibition of photochemical activity caused by filipin is a secondary effect resulting from a change in membrane conformation induced by the antibiotic.

1162 GERMAINE, G. R. and MURRELL, W. G. Effect of dipicolinic acid on the ultraviolet radiation resistance of Bacillus cereus spores.
Photochem. Photobiol. 17:145-54, 33 refs. (1973)

The ultraviolet radiation (UV) resistance of B. cereus spores was shown to depend on their content of dipicolinic acid (DPA). Wild-type spores with decreasing amounts of DPA exhibited increased UV resistance. Similarly, spores devoid of DPA (DPA-minus), produced by a mutant strain of B. cereus unable to synthesize DPA, were more resistant to UV than mutant spores (DPA-plus) produced in the presence of exogenously supplied DPA. Resistance of both the wild type and mutant strains to ionizing radiation, however, was unaffected by DPA content. Comparison of the resistance of DPA-minus and DPA-plus mutant spores to UV of various wavelengths

showed that the greater sensitivity of the latter DPA-plus spores appeared at wavelengths corresponding to the region of the first molecular absorption band of the calcium chelate of DPA. In the wild type and mutant, thymine photoproducts were produced at a greater rate and to a greater extent in spores with high levels of DPA than in spores with low DPA. The data indicate that DPA transfers energy to DNA in vivo, which leads to the conclusion that DPA occurs in the spore protoplast.

1163 OAKENFULL, D. Effects of hydrophobic interaction in the kinetics of the reactions of long chain alkylamines with long chain carboxylic esters of 4-nitrophenol.
J. chem. Soc., Perkin Trans. 2. no. 7:1006-12, 39 refs. (1973)

The kinetics of the reactions of some long chain alkylamines with long chain carboxylic esters of 4-nitrophenol have been studied. Hydrophobic interactions caused large increases (up to 10^7-fold) in the rate of the amine-catalysed (termolecular) reaction, compared with the corresponding reaction of ethylamine with 4-nitrophenyl acetate. In aqueous ethanol, the maximum effect from hydrophobic interaction occurred when the composition of the mixed solvent coincided with the maximum development of structure. In those cases where the hydrocarbon chain of the amine was at least as long as that of the ester, the decrease in the free energy of activation was that predicted from theoretical calculations of the free energy supplied to the transition state by the hydrophobic interaction.

1164 OLLEY, June and RATKOWSKY, D. A.† Role of temperature function integration in monitoring of fish spoilage.
Fd Technol. N.Z. 8(2):13, 15, 17, 7 refs. (1973)

The value of using temperature integrators and radiotelemeters to monitor temperature in fish holds, and thus assess spoilage rates in storage, is discussed. A temperature function integrator and multipoint telemeter (Telfimupot), which enables temperatures to be measured in, and transmitted from various places in the fish hold, was used to assess the overall spoilage resulting from a particular temperature history during storage. Knowledge of the appropriate relationship linking spoilage rate with temperature is presented. Results of a study of 70 sets of spoilage data that were drawn mainly from work on fish, but included also work on meat, shellfish, and poultry, establish the relationship between relative spoilage rate and temperature.

† Division of Mathematical Statistics

1165 RAISON, J.K. Influence of temperature-induced phase changes on the kinetics of respiratory and other membrane-associated enzyme systems.
Bioenergetics 4:559-83, 63 refs. (1972)

Changes in activation energy of enzymes in terms of temperature-induced phase changes in the system are discussed, with particular reference to "crystalline" enzymes and membrane-associated enzymes of both plant and animal origin. Some of these enzymes exhibit a change in activation energy with temperature and in certain cases it is possible to relate these changes in activation energy to an alteration in the physical properties of membrane lipids. The significance of a change in activation energy is also discussed in terms of the physiological function of plants and animals at various temperatures.

Dairy Research Laboratory

P.O. Box 20, Highett, Vic. 3190.

1166 KIESEKER, F.G. Some production aspects and uses of dried milk products.
Aust. J. Dairy Technol. 28(2):48-50 (1973)

It is only within relatively recent years that dried milk products have been produced on a regular commercial basis. Evaporators and driers have increased dramatically in size and capacity. Attention has been given to the uniformity of particle size produced in an effort to reduce the level of fines in the resulting powder. As the use of milk powder becomes more widespread, buyers are setting standards which provide a powder better suited to their needs. The main items covered in their specifications are moisture, fat, acidity, scorched particles, solubility index, bacteriological content, whey protein nitrogen index, heat stability, and viscosity.

1167 MULLER, L.L., HAYES, J.F. and GRIFFIN, A.T.* Studies on whey processing by ultrafiltration. 1. Comparative performance of various ultrafiltration modules on whey from hydrochloric acid casein and Cheddar cheese.
Aust. J. Dairy Technol. 28(2):70-7, 19 refs. (1973)

Preliminary studies have been made on the performance of five types of ultrafiltration (U.F.) equipment on hydrochloric acid (HCl) casein whey and Cheddar cheese whey. The U.F. modules included in the study were selected from those designed to operate at "low" pressures - up to 690 kPa. Pilot plants were constructed to include U.F. modules with membranes of cellulose acetate (Abcor Inc., Patterson-Candy International) or of synthetic co-polymers (Amicon Corporation, Dorr-Oliver). An operating temperature of 50°C was used throughout to minimize microbial growth and optimize performance. Typical permeation rates are given for each of the U.F. pilot

plants. On each plant HCl casein whey gave permeation rates averaging only about 60% of those for Cheddar cheese whey at their normal pH values, respectively, 4.1-4.4 and 5.7-6.4 measured at 50°C. Both wheys gave low permeation rates at pH 4.1-4.4 and high rates at pH values below 3.0. As the pH increased above 5.0 permeation rates improved with Cheddar cheese whey but there was little improvement with HCl casein whey. It was found necessary to start each trial with a freshly cleaned module and use whey already adjusted to the desired pH. If pH of the whey was adjusted during circulation, a deposit formed on the membrane from the whey was likely to act as a secondary membrane and by governing the permeation rate at least partly mask pH effects.

1168 SHANLEY, R. M. Analysis of free sugars in yoghurt.
Aust. J. Dairy Technol. 28(2):58-60, 8 refs. (1973)

A simple technique for the extraction, paper chromatographic separation and quantitative determination of the free sugars from yoghurt is described. Typical mono- and disaccharides contents of some commercial yoghurts are tabulated. No hydrolysis of sucrose was observed during storage of sweetened yoghurt for one month at 2°C.

1169 VANDERHEIDEN, G. J. Instrument for the objective characterization of the texture of semi-solid materials
Aust. J. Instrumn Control 29(3):81-2, 1 ref. (1973)

A detailed technical description is presented for an instrument which has been designed and developed for the objective assessment of the firmness and textural characteristics of cheese. It is considered that with a resolution of the structure of the sample material in the order of 0.1 mm, this instrument may lend itself successfully to applications in the study of other semi-solid materials.

DIVISION OF BUILDING RESEARCH

P.O. Box 56, Highett, Vic. 3190.

Forest Products Laboratory

P.O. Box 310, South Melbourne, Vic. 3205.

1170 GREAVES, H. Outside storage of tropical hardwood chips. 3. Microbial ecology of chip piles after two and four months storage.
Appita 27(1):25-30, 33 refs. (1973)

A study has been made of the microbial ecology of mixed tropical hardwood chips stored for two and four months in equatorial New Guinea in experimental conical-shaped piles, 40 ft diameter by 25 ft high. Biodeterioration in the

form of discolouration and loss in wood substance occurred. Discolouration by dematiaceous fungi, hyaline phenoloxidase-producing micro organisms, and non-microbial reactions affected 33% of the pile after two months storage and 85% after four months. Loss in wood substance, including cellulose as estimated by microscopic methods, increased from 2% at two months to 7% after four months, soft rot fungi and bacteria playing a significant role initially, followed by basidiomycete attack in the outer two ft of the pile after four months. A successional trend of micro organisms, beginning with a rapid invasion of billets and freshly-chipped materials was established, and it is clear that the build-up in temperature which took place within the piles immediately after construction had a pronounced effect on the micro-flora which developed. Profiles of the piles during breakdown are presented to illustrate the distribution of major microbial activity. Comment is included on the extent of microbial biodeterioration as it might affect subsequent paper making and on the effect of re-storage of chips after pile breakdown.

1171 KAUMAN, W. G. and KLOOT, N. H. Strategy for utilizing the potential of multi-specific forests.
Wld Forestry Congr., 7th, Buenos Aires (Argentina), 1972.
pp. 1-21, 28 refs.

Most multispecific forests are in the tropics; foresters are confronted with the problem of utilization in a way that will benefit the underpriviledged population of the countries concerned, without upsetting ecological balances. Rational forestry legislation, competent forestry services and lower trade balances are important aims, but realistic estimation of available and accessible timber has a high priority. Rapid wood property evaluation may help to reduce costs by extending the number of marketable species, but hasty introduction of sophisticated methods may be counterproductive. Pulp and paper industries form another major market, but these may be limited to regional development owing to the need for large investment. Attention is drawn to the possibilities of chip production, and the implications of adequate quality control are discussed. Establishment of fauna and forest reserves can form a tourist attraction while stressing the economic benefits of maintaining forest cover. Research should establish the possibilities of regeneration and silviculture to indicate volume maintenance and balance between native and exotic areas. Further tactics to increase sales of forest products include grading, standardization, marketing policies and tax concessions.

1172 NICHOLSON, J. E., BARNACLE, J. E. and LESSE, P. F. Evidence of residual stress in small sections of ordinary green Eucalyptus regnans.
Wood Sci. Technol. 7(1):20-8, 12 refs. (1973)

Conclusive evidence is offered to show the existence of significant residual elastic stress in the form of alternate layers of tension and compression in relatively small pieces of normal green eucalyptus wood. A method of detecting residual stress in small samples of wood is described, and the stress distribution approximated from deflection measurements following a formula widely used in the science of metallurgy.

DIVISION OF PROTEIN CHEMISTRY

343 Royal Parade, Parkville, Vic. 3052.

1173 HOLT, L. A. and MILLIGAN, B. Application of enzymic hydrolysis and tritium labelling to a study of the modification of tryptophyl residues in proteins.
Aust. J. biol. Sci. 26(4):871-6, 17 refs. (1973)

The tryptophyl residues of apomyoglobin, S-carboxymethyl-lysozyme, and wool have been radioactively labelled in order to follow their reactions more easily. Whereas enzymic hydrolysis of these proteins gives good yields of tryptophan, it was found that enzymic hydrolysis of apomyoglobin, after either ozonolysis or treatment with o-nitrophenylsulphenyl chloride, released only part of the resultant modified tryptophyl residues. Enzymic hydrolysis gave a number of labelled products from the above proteins after irradiation with simulated sunlight, but only kynurenine could be identified. The isolation of yellow, radioactively labelled material from the enzymic hydrolysates of these irradiated proteins provides direct evidence that the yellow colour developed by irradiated wool and other proteins originates from tryptophyl residues.

1174 MILLIGAN, B. and WOLFRAM, L. J.* Acetylation of wool.
J. Text. Inst. 64(3):170-4, 15 refs. (1973)

Some of the procedures used to acylate wool are appraised, and the nature of reactions involved and the types of protein side chains affected are described. Results confirm that acid hydrolysis of the acetylated wool produces ornithine and that the arginine content is much less than that of untreated wool. The objectionable discolouration imparted to wool when boiling acetic anhydride is used can be virtually eliminated by performing the reaction with dimethylformamide or dimethyl sulphoxide used as a solvent. Acetic anhydride and acetyl chloride reacted to a much greater extent than p-nitrophenyl acetate and N-acetoxysuccinimide. It is concluded that N-acetoxysuccinimide is the best reagent for modifying lysine residues without simultaneously introducing large numbers of O-acetyl groups, as no

discolouration occurs. The dye-binding capacity of wool treated under carefully controlled conditions with acetic anhydride dissolved in acetic acid is reduced to a very low level, but not due solely to acetylation of basic side chains. Elliot and Speakman were undoubtedly correct in concluding that the observed dye-resist effect was due primarily to introduction of strongly acidic sulphate groups and less to acetylation of basic groups. Replacement of acetic acid by dimethyl sulphoxide led to an even higher sulphation level, but at the expense of acetylation. Thus neither of these procedures is satisfactory for acetylating wool.

DIVISION OF TEXTILE PHYSICS

"The Hermitage", 338 Blaxland Road, Ryde, N.S.W. 2112.

1175 BEEVERS, R. B. Refractometric method for the determination of the concentration of polyurethane resin in treatment baths. J. Text. Inst. 64(3):124-7, 8 refs. (1973)

A refractometric method was examined as an analytical procedure for determination of the concentration of polyurethane (Synthappret LKF) resin in treatment baths. Over the range 5-50 g/l, the resin concentration and refractive index have a linear dependence that is given by:

$$c = 0.11 \{ (n^{25}s - 0.0004) - n^{25}r \} \times 10^5,$$

where n s and n r are the refractive indices of the solvent and resin solution respectively, and c is the concentration of resin in g/l.

1176 MAKINSON, K. Rachel. Integration of various observations on the mechanisms of 'degradative' anti-felting treatments. J. Text. Inst. 64(4):228-30, 19 refs. (1973)

A common factor of many previously reported observations in which keratin is attacked chemically is now shown to be the softening of the protein content of the cuticle cells in water due to osmotic swelling as a result of covalent bond scission or formation of charged groups, usually sulphonic acid or related groups. In mild treatments the scales may appear to remain unchanged.

1177 WATT, I. C. Natural and synthetic polymeric fibres. Proc. R. Aust. chem. Inst. 40(6):178-81 (1973)

A report on the RACI Polymer Division's 1973 Summer School held at the University of Sydney is presented. Lectures given included topics dealing with the structural features of fibres in relation to properties, polymer treatments to modify fibres, textile applications and the role of fibres in composites.

DIVISION OF TEXTILE INDUSTRY

P.O. Box 21, Belmont, Vic. 3216.

1178 ELLIS, B.C. and WALLS, G.W. Twist distribution in self-twist weaving yarns (STT). 3. Implications of twist-level effects.
Text. Inst. Ind. 11(5):120-2, 1 ref. (1973)

Recommendations for self-twist and added twist values, and conditions for STT yarn steaming and winding, warping and weaving are given. Finishing techniques for self-twist fabrics are described and fabric properties discussed. Some STT yarns are capable of producing fabrics which, without detailed analysis, are indistinguishable from those made with conventionally-spun yarns. Such differences in processing and performance which do exist are, in most circumstances, advantageous and these include: (a) maximum fabric set is slightly lower than for ring-spun yarns; (b) fabrics are less easily burst in finishing and felting shrinkage on washing is usually lower; (c) fabric stretch and extension at break are greater. Increasing the self-twist level or either raising or lowering the recommended added twist level relative to the self-twist quantity will progressively impair processing performance. More importantly, all fabric properties will progressively deviate from the conventional ring-spun product and, although there may be special fabrics where this fact can be used to advantage, such deviations can only be regarded as a penalty in the general bulk of production.

1179 HOSKINSON, R.M. and RUSSELL, I.M. Studies on textile insectproofing. 2. Substituted phenylthioureas, including fibre-reactive derivatives.
J. Text. Inst. 64(3):144-52, 34 refs. (1973)

A series of substituted phenylthioureas was prepared and examined for feeding inhibition of clothes-moth and carpet-beetle larvae. Some of these compounds were fibre-reactive. Bioassay indicated that bisulphite-assisted applications of N-phenyl-N'-vinylsulphonylpropionylthiourea (1% w/w) were fast on wool during laundering and dry cleaning. With the exception of N-phenyl-N'-(benzothiozol-2-yl)thiourea, the moth-active compounds were poor inhibitors of carpet-beetle feeding.

1180 WHITE, M.A. Development of an all-wool permanent press process.
Text. J. Aust. 48(6):20-3, 60-1 (1973)

Invention of the solvent-resin-steam process for providing permanent press with wool garments and its development to the full industrial stage is described in detail. Basic steps are: application of the resin to the ready-made garment in organic solvent, pressing to the desired shape, and curing the resin and permanently setting the shape in a steam oven. Moisture-curing isocyanate-terminated, polyurethane pre-polymers

(e.g. Braxan LFA - Geigy-Ciba or Synthappret LKF - Bayer), dissolved in perchlorethylene are used. Resin is applied in a batch solvent processing unit similar to a dry-cleaning plant by spraying or controlled extraction technique, using a low extraction speed (22-24 g) to ensure uniform resin deposition. It is essential to pre-scour in clean solvent to remove possible contaminants. Steaming is carried out either in an autoclave or atmospheric pressure oven, the former being suited for knitted outerwear. Fully automatic steamers of up to 270 garment capacity were manufactured to CSIRO designs, the garments hanging from roof rails on a trolley. Advantages of the process are that it is amenable to commission processing, colour changes on steam setting are neglibible, physical properties of the garment are not affected and seam puckering on washing and drying is greatly reduced.

DIVISION OF APPLIED CHEMISTRY

P.O. Box 4331, Melbourne, Vic. 3001.

--- BEECHAM, A.F.†, HURLEY, A.C.†, MATHIESON, A.McL.† and LAMBERTON, J.A. Absolute configuration by X-ray and circular dichroism methods of calycanthine.
Nature Phys. Sci. 244(132):30-2, 12 refs. (1973)
See abstract no. 1190

† Division of Chemical Physics

1181 CULVENOR, C.C.J. and SMITH, L.W. Crotanecine ester alkaloids of Crotalaria agatiflora.
An. de Quimica 68:883-92, 6 refs. (1972)

The vegetative parts of C. agatiflora have been examined and found to contain madurensine, anacrotine and six new crotanecine ester alkaloids. Four of the new alkaloids are shown to be 7-acetylmadurensine and its cis isomer and 6-acetylanacrotine and its trans isomer. The other two alkaloids are probably the diester of retronecic acid with crotanecine and the angelyl ester of trans-anacrotine.

at Forest Products Laboratory

P.O. Box 310, South Melbourne, Vic. 3205.

1182 BLAND, D.E. and MENSHUN, M. Effect of milling and alkali treatments on the accessibility of the lignins of Pinus radiata and Eucalyptus regnans.
Holzforschung 27(2):33-5, 5 refs. (1973)

Vibratory ball milling of wood meal produced a large increase in the amount of lignin soluble in cold (20°C) 0.1 M aqueous sodium hydroxide. This effect

was greater for P. radiata than for E. regnans. These results indicate a mechanical liberation of lignin by the milling and/or cleavage of alkali-sensitive bonds. The yield of milled wood lignin from alkali-treated milled wood of E. regnans was equal to the amount of lignin soluble in cold alkali but was much less from P. radiata apparently because of solubility limitations. Hot (95°C) alkali treatment of milled wood led to a higher amount of alkali soluble lignin and a lower yield of milled wood lignin for both species. About half of the lignin appears to be bound to carbohydrate by bonds resistant for both species. About half of the lignin appears to be bound to carbohydrate by bonds resistant to alkali at 20°C.

1183 COLLEY, J. Properties of blends of E. tetrodonta and P. radiata pulps.
Appita 27(1):35-41. 8 refs. (1973)

Papers were made from bleached kraft pulps derived from Eucalyptus tetrodonta F. Muell and Pinus radiata D. Don. In the first phase of the experimental work 14 separate blends were prepared from these pulps at various combinations of degrees of beating and component pulp proportions by weight. The breaking length, stretch, burst factor, tear factor, folding endurance, air resistance and bulk of the handsheets and the Canadian Standard Freeness of the blended stock were measured. A model equation was fitted to the experimental data and used to plot response graphs for the various blends. In the second phase of the experiment, blends were prepared from four combinations of the pulps beaten at two levels. Six combinations of pulp proportions were studied for each beating combination. The results from the second phase of the study confirmed the trends indicated by the preceding work and demonstrated that the properties of most of the blends could be approximately predicted from a simple addition of the weighted proportions of the properties of the components. The main exceptions to this rule were the tear factor and log folding endurance of a blend of slightly beaten P. radiata with E. tetrodonta at various freenesses, which exhibited marked positive deviations from linear additivity. The use of response graphs for the assessment of the potential of various pulp blends is demonstrated. The experiment supported the conclusions reached in the previous paper that eucalypts species in the high basic density range are a satisfactory raw material for making fine papers or papers in which high strength is not of paramount importance.

11-4 DE YONG, J. L. Design and operation of the FPL sequential digester.
Appita 27(1):47-50 (1973)

A description of the design, construction and operation of a laboratory-scale experimental digester is presented. The equipment operates on a multi-stage principle, and consists of an interconnected system of vessels, whereby pulping liquors can be heated under pressure before being introduced sequentially into the reaction vessel. Liquor flows may be

programmed by a fluidic device which controls a system of pneumatically operated ball valves. Liquors ranging in pH from 2 to 14 may be handled at temperatures up to 200°C and pressures up to 1400 kPa.

1185 HIGGINS, H. G. and PHILLIPS, F. H. Technical and economic factors in the export of wood chips from Australia and Papua New Guinea. 1. Market for chips.
Aust. Forest Inds J. 39(1):47-53. 26 refs. (1973)

A report, prepared for wood chip exporters, concerning relevant features of the Japanese pulp and paper industry, and its demand for wood chips is presented. Possible markets for chips outside Japan are discussed and competition for these markets from other countries is outlined.

1186 HIGGINS, H. G. and PHILLIPS, F. H. Technical and economic factors in the export of wood chips from Australia and Papua New Guinea. 2. Chip export from Australia and Papua New Guinea.
Aust. Forest Inds J. 39(2):31-43. 47 refs. (1973)

The present domestic utilization of pulpwood is outlined as a basis for determining the potential wood chip export resources of Australia and Papua New Guinea. A review of some export projects underway in both countries is presented and some of the technical problems facing new chip exporters are discussed.

1187 HIGGINS, H. G. and PHILLIPS, F. H. Technical and economic factors in the export of wood chips from Australia and Papua New Guinea. 3. Evaluation of chips.
Aust. Forest Inds J. 39(3):33-40. 14 refs. (1973)

The value of wood chips for pulping at a mill depends primarily on freight, pulp yield and pulp quality. Each factor is discussed in an evaluation of wood chips as an export product in Australia and Papua New Guinea.

1188 HIGGINS, H. G., WATSON, A. J. and DE YONG, J. Sequential alkaline digestion.
Appita 27(1):41-6. 6 refs. (1973)

The FPL Sequential Digester has been designed as a research tool for use in investigations aimed at minimizing undesirable side effects which occur during chemical pulping, reducing chemical consumption and bleach demand, increasing hemicellulose retention and pulp yield, and improving paper properties. The apparatus operates on a multistage principle and consists of an interconnected system of vessels, whereby pulping liquors of various compositions can be heated under pressure before being introduced sequentially into a reaction vessel. Exploratory experiments are described which illustrate the effects on alkaline pulping of hardwoods of interspersed washings at temperature, sequences of treatments at low total alkali, pre-extraction and variation in pH and in the nature and concentration of cooking chemicals.

DIVISION OF CHEMICAL PHYSICS

P. O. Box 160, Clayton, Vic. 3168.

1189 --- Gas cylinder trolley.
Proc. R. Aust. chem. Inst. 40(2): (1973)
See Abstract no. 846.

1190 BEECHAM, A. F., HURLEY, A. C., MATHIESON, A. McL. and LAMBERTON, J. A.† Absolute configuration by X-ray and circular dichroism methods of calycanthine.
Nature Phys. Sci. 244(132):30-2, 12 refs. (1973)
Anomalies in the absolute configurations of compounds determined using circular dichroism spectra and the X-ray Bijvoet method are discussed. An assertion that all configurations determined by the Bijvoet are wrong is shown not to be true for calycanthine and it is concluded that, whatever the source of the anomaly, it is unlikely that it can be ascribed to a fundamental defect in the Bijvoet X-ray technique.

† Division of Applied Chemistry

1191 BOX, G. F. and MELDRUM, J. R. Detector/amplifier/indicator for dual-beam spectrophotometric systems.
Aust. J. Instrumn Control 29(3):74-6 (1973)
A detector/amplifier/indicator system suitable for inclusion with double-beam optical assemblies is discussed. The circuit is capable of maintaining an output indication constant within 0.5% over a period of 24 hrs despite mains fluctuations of ± 10% and lamp-intensity variations of 50%.

1192 HURLEY, A. C. Thermochemistry in the Hartree-Fock approximation.
Adv. Quantum Chem. 7:315-34, 48 refs. (1973)
Results indicate that, for a range of small molecules, recent self-consistent-field molecular orbital calculations can be used to estimate the Hartree-Fock limit to within near "chemical accuracy". Discussion is limited to molecules composed of hydrogen and the first-row elements. The total energies obtained in this way have been used to show that the Hartree-Fock approximation gives a good account of the thermochemistry of these chemically stable small molecules.

1193 WALSH, A. Non-dispersive systems in atomic absorption spectroscopy.
Pure appl. Chemy 34(1):145-62, 36 refs. (1973)

In spectrochemical methods based on atomic absorption measurements the usual procedure is to pass radiation from an atomic spectral lamp through an atomic vapour of the sample and measure the attenuation in the intensity of a selected resonance line, the latter being isolated by means of a dispersion monochromator. In the techniques of selective modulation and of resonance detection, photoelectric signals due to resonance lines are electronically isolated from signals due to other lines and a dispersion monochromator is not required. In flame fluorescence it is also not necessary to provide means for optically resolving and isolating the resonance lines in the fluorescence radiation, provided it is ensured that the atomic spectral lamp which stimulates the fluorescence emits the spectrum of only one of the elements to be determined. For several elements, each of these non-dispersive techniques can yield a performance which is of the same order as, and sometimes superior to, that which can be achieved with a conventional dispersion-type atomic absorption spectrophotometer. It has recently been demonstrated that these techniques can be successfully adapted to the direct analysis of metals and alloys, by making the sample for analysis the cathode of a selective modulator or resonance detector. The analytical capabilities of such systems are currently being assessed.

DIVISION OF MINERAL CHEMISTRY

P.O. Box 124, Port Melbourne, Vic. 3207.

1194 FLÖRKE, O.W.*, JONES, J.B.* and SEGNIT, E.R.
Genesis of hyalite.
Neues Jb. Miner. Mh no. 2:82-9, 14 refs. (1973)

Evidence from both natural occurrences and hydrothermal syntheses suggests that hyalite is deposited as a result of chemical transport in the vapour phase. The material, both natural and synthetic, resembles silica glass in many respects but also fulfils the criteria for opal-A and should be classed as such in spite of the contrasted origin.

DIVISION OF CHEMICAL ENGINEERING

P.O. Box 312, Clayton, Vic. 3168.

1195 PEELER, J.P.K. and PIGGOTT, K.L. Combined gas turbine-steam cycle for power generation. 1. A literature survey and discussion.
Mech. chem. Engng Trans. Instn Engrs Aust. MC 8(2):125-30, 38 refs. (1972)

A comprehensive literature survey has been carried out on combined cycles incorporating a gas turbine operated in conjunction with a steam cycle. It is proposed that, for ease of classification, the main types of combined cycle be grouped under the titles of exhaust heat and exhaust powered systems. Combined cycles have found application in the process industries and power industry areas, with most systems reporting an improvement in overall cycle efficiency and where costs are discussed, a saving in specific power cost.

1196 PEELER, J.P.K. and PIGGOTT, K.L. Combined gas turbine-steam cycle for power generation. 2. Theoretical study of a coal fired system.
Mech. chem. Engng Trans. Instn Engrs Aust. MC 8(2):130-5, 13 refs. (1972)

A mathematical model of a carboniser-gas-turbine-steam cycle, derived on the basis of generalised material and enthalpy balances, was used to calculate the important thermodynamic and cost parameters and hence the energy cost for the combined cycle and its comparative conventional cycle. Use of a digital computer enabled a wide range of variables to be studied. Cycle capacities between 40 and 660 MW were examined, and for a present-day gas turbine inlet temperature of 871°C, a 275 MW combined cycle station should give a reduction in energy cost of 3.2% relative to the comparable conventional station; this saving diminishes with increase in total cycle capacity, e.g. to 1.3% for a 660 MW installation. For a 275 MW unit, increasing the gas turbine inlet temperature increases the energy cost reduction, e.g. to 4.5% at 975°C; however, for any given coal there is an upper limit to this inlet temperature, depending upon its volatiles content.

DIVISION OF MINERALOGY

CSIRO Private Bag, Wembley, W.A. 6014.

Sydney Laboratory

P.O. Box 136, North Ryde, N.S.W. 2113.

1197 HAYES, J.W.*, MILLAR, D.J.*, RADFORD, D.V.* and SAXBY, J.D. Conformation of triphenylbismuthine and tris-(p-chlorophenyl)-bismuthine in benzene solution. J. chem. Soc., Dalton Trans. no. 10:1101-2, 12 refs. (1973)

Molar Kerr constant, dipole moment, and dielectric relaxation measurements of $(p\text{-}C_6H_4Cl)_3Bi$ in benzene solution indicate a C-Bi-C bond angle of 93° and an average rotation (in the same sense) of each C_6H_4Cl group about its C-Bi bond of 45° from a model in which the aromatic p[illegible]es intersect along the symmetry axis. A similar configuration in solutio[illegible] likely in the case of Ph_3Bi, for which a C-Bi-C bond angle of 94° has been reported in the solid state.

1198 HESP, W.R. Hasznosítható ásványtelepekre és feldolgozásukra vonatkozó vizsgálatok Ausztráliában. [Investigations on mineral deposits and their processing in Australia.] (Article in Hungarian) Osztalyanak Kozlemenyei, MTA 10. 5(1/2):27-34, 42 refs. (1972)

Research programmes of the Minerals Research Laboratories of CSIRO comprise studies on ore genesis and mineral processing. Investigations of fundamental nature are carried out on the formation of mineral deposits in granites (Sn, Mo, W, Cu) in ultramafic rocks (Ni, Cr) and in sedimentary rocks (Pb, Cu, Zn). New methods are also being developed for the exploration of mineral oil and natural gas occurrences. Other fundamental studies are concerned with mineral processing such as combustion of coal and the production of metals from ores. On the applied side examples of research include the processing of mineral sands to produce rutile from ilmenite, the pelletization of iron ores prior to metallurgical treatment, fluidized-bed combustion of coal, electrostatic cleaning of flue gases, manufacture of pyrolytic carbon for industrial electrodes, electro-cracking of hydrocarbons to produce acetylene and the manufacture of filter-aids from coal.

DIVISION OF TRIBOPHYSICS

University of Melbourne, Parkville, Vic. 3052.

1199 HEAD, A.K. and WOOD, W.W.* Dislocation group dynamics. 4. General solutions of the continuum approximation.
Phil. Mag. 27(3):505-17, 3 refs. (1973)

The general motion of a dislocation distribution is considered for the case where the individual dislocations follow a linear stress-velocity law. A function of a complex variable is introduced and it is shown that the dislocation motion corresponds to the flow of this function along characteristics in the complex plane. For screw dislocations the stress field of the distribution and the distribution itself are different aspects of the same function and are determined together. It is shown that this complex representation is fully determined for an applied stress field which is a constant, a linear, or a quadratic function of position and the extension of this method to other stress fields is discussed.

1200 HEAD, A.K. and WOOD, W.W.* Dislocation group dynamics. 5. Equilibrium revisited.
Phil. Mag. 27(3):519-30, 4 refs. (1973)

The equilibrium of a dislocation distribution is considered for the case where the applied stress field is a rational function. A function of a complex variable is introduced and it is shown that for equilibrium this function satisfies a quadratic equation. The stress field of the distribution and the distribution itself are different aspects of this complex function and are determined together. The known prevalence of square roots in distributions is a consequence of finding the roots of the quadratic equation. The connection between this complex representation of equilibrium and that used in Pt 4 for dislocation dynamics is discussed.

1201 HEAD, A.K. Dislocation group dynamics. 6. The release of a pile-up.
Phil. Mag. 27(3):531-9, 3 refs. (1973)

A dislocation distribution is initially in equilibrium, piled up against a block by a uniform applied stress. The block is removed and the subsequent motion of the distribution, for a linear stress-velocity law, is analysed by the complex representation introduced in Pts 1 to 4 of this study of dislocation group dynamics. It is shown that complete information about the motion is contained in a root of a cubic equation. Particular aspects of the motion which are considered include the changing shape of the distribution, the positions of its leading and trailing edges, the rising stress at a point on the slip plane ahead of the distribution and asymptotic limits at large time.

1202 HUNT, G. L.*, RITCHIE, I. M.*, ESDAILE, R. J. and SANDERS, J. V. Nickel-fluorine reaction in the presence of xenon.
J. Catalysis 25(3):460-2, 5 refs. (1972)
The kinetics of the nickel-fluorine reaction have been determined, both in the presence and absence of xenon, to assess the possible catalytic effects of xenon on the reaction. Results indicate that the xenon has little effect on the reaction rate. The catalytic studies of Baker and Lawson, from which the catalytic effect was proposed, were carried out using nickel foils and it is possible that the enhanced attack they observed only takes place on catalytically active surfaces.

1203 MAINWARING, D. E. Zeolitic molecular sieves.
Proc. R. Aust. chem. Inst. 40(6):163-9, 28 refs. (1973)
The development of knowledge relating to zeolites and their applications as molecular sieves is outlined followed by a detailed discussion of the structures of zeolitic frameworks, particularly the sodalite and chabazite groups.

1204 ROBINSON, P. M. Melbourne Research Forum - rate dependent deformation.
Metals Aust. 5(2):45-7 (1973)
A Materials Research Forum was organized by the Physical Metallurgy Division of the Melbourne branch of the Australian Institute of Metals in Dec., 1972. Current research on rate dependent deformation is summarized in reports of the 16 papers that comprised the Forum.

DIVISION OF PHYSICS

National Standards Laboratory, University Grounds,
City Road, Chippendale, N.S.W. 2008.

1205 HARIHARAN, P. Application of holographic subtraction to time-average hologram interferometry of vibrating objects.
Appl. Optics 12(1):143-6, 12 refs. (1973)
Useful information can be obtained about vibrating objects at small vibration amplitudes with a relatively simple system by applying the method of holographic subtraction. In this two holographs of the object are recorded in succession on the same plate with the phase of one of the beams shifted by 180° between the two exposures. The areas of the object that remain unchanged unchanged between the two exposures then disappear, and only that portion of the object field that differs is seen in the reconstructed image. In order to confirm the feasibility of this technique, a series of experiments was carried out using a modified halographic system. The test object consisted of a circular diaphragm (0.23 mm tinplate) clamped at its perimeter in a relatively massive mount.

DIVISION OF ENVIRONMENTAL MECHANICS

P.O. Box 821, Canberra City, A.C.T. 2601.

1206 PHILIP, J.R. Integral properties of flows satisfying mixed no-slip and no-shear conditions.
J. appl. Math. Phys. 23(6):960-8, 1 ref. (1972)

Total momentum flux considerations lead simply to integral properties of five examples of viscous flows satisfying mixed no-slip and no-shear conditions. The integral results may be inferred from the velocity distributions at the slots only. This simplicity of integral properties holds for a wider class of flows subject to mixed conditions: the no-shear slots may be distributed irregularly and may occur in two separate surfaces (parallel plates or concentric tubes). It carries over also to analogous slow flows with arbitrary distributions of no-shear patches in the boundaries. The work yields a number of definite integrals.

DIVISION OF MECHANICAL ENGINEERING

P.O. Box 26, Highett, Vic. 3190.

1207 COOPER, P.I. Heat and mass transfer within a single-effect solar still envelope.
Australas. Conf. Heat Mass Transfer [Proc.], 1st, Monash Univ., Melbourne, 1973. Section 5.1, pp. 1-8, 11 refs.

The simultaneous energy transfer modes within a solar still envelope have been examined from a theoretical and experimental point of view over a wide range of operating conditions. Energy transfer rates up to three times that which can occur under normal conditions have been investigated. Dimensionless correlation of the experimental data together with that from another source suggests the following relationship for evaporative mass transfer,

$$Sh/\theta = 0.043\ (Gr'\ Sc)^{1/3}$$

where θ is a ratio of partial pressures to allow for the effect of mass transfer rate on the mass transfer coefficient at high mass transfer rates. At low mass transfer rates ($\theta \simeq 1$) the correlation above with the absolute humidity differences as the driving potential becomes,

$$Sh' = 0.066\ (Gr'\ Sc)^{1/3}$$

This compares favourably with a relationship from the analogy between heat and mass transfer which gives a coefficient of 0.067 in the above formula. The distillation rate within a solar still envelope is shown to be primarily dependent on the energy input rate at steady state conditions with negligible losses.

1208 DEUTSCHER, K.O.*, DUNKLE, R.V. and MEGLER, V.R.* Fundamental study of heat, mass and momentum transfer in a parallel passage evaporative cooler pad.
Australas. Conf. Heat Mass Transfer [Proc.], 1st, Monash Univ., Melbourne, 1973. Section 5.2, pp. 7-14, 7 refs.

A theoretical study of the evaporative cooling process and the application of the theory to the parallel passage evaporative cooler pad is presented. Correlation of established solutions for momentum and heat transfer during laminar flow between broad parallel plates with experimental values of pressure drop and saturation efficiency for a parallel passage pad is obtained after making allowances for the form drag on the fibre ends which project into the air stream at the pad entrance and exit, and for the pick up of liquid water from the pad surface and its subsequent evaporation into the air stream downstream of the pad. Details are given of a procedure for the rational design of a parallel passage evaporative cooler pad in which allowance is made for the deviation of the Lewis number from unity.

1209 PERRY, J.H. Examination of some boundary layer methods used in industry.
Australas. Conf. Heat Mass Transfer [Proc.], 1st, Monash Univ., Melbourne, 1973. Section 4.2, pp. 65-72, 34 refs.

The findings of a boundary layer working party set up by Rolls-Royce Ltd. (Derby, U.K.) to compare, with published experimental data, various boundary layer methods used in turbomachinery design and analysis are summarised. Areas examined include: (a) the turbulent boundary layer, with and without surface heat transfer, in compressible and incompressible flow; (b) boundary layers combining laminar, transitional and turbulent flows (e.g. on compressor or turbine blades) with heat transfer; and (c) turbulent boundary layers with suction or ejection of air through porous surfaces.

1210 ROBESON, K.A. Air flow measurement in air conditioning systems.
Aust. Refrig. Air Condit. Heat. 27(6):21-8, 4 refs. (1973)

To assess the state of the art of measuring air flows in air conditioning installations over 60 groups representative of air conditioning consulting engineers, contractors, equipment manufacturers and government building authorities have taken more than 500 measurements of air flow at one or more of ten measuring points in a special conditioning and distribution system set up at the Division of Mechanical Engineering. Results were subsequently analysed and discussed at a symposium attended by the participants and it was found that: (a) duct flow measurements by skilful operators using pitot tube traverses could be made with an accuracy within ±5%; (b) coil face measurements were primarily made using moving vane anemometers and due to variations in techniques and correction factors resulted in errors between +2% and +72% with the mean of all readings being 35% too high;

and (c) wall and ceiling register discharge rates proved equally difficult to measure. Results within ± 10% were obtained by only 34% operators for ceiling diffusers, 27% operators for wall registers and 16% operators for slot type registers. During the symposium it was agreed that there was a need for an accessible air flow measurement facility where operators could check their own measuring instruments and techniques against known air flows from registers of different types.

DIVISION OF MATHEMATICAL STATISTICS

Private Bag No. 1, Glen Osmond, S. Aust. 5064.

1211 COY, J. F.*, LEWIS, I. C.*, MAIR, C. H.*, LONGMORE, E. A. and RATKOWSKY, D. A. Growth of Tasmanian infants from birth to three years of age.
Med. J. Aust. 2(1):12-18, 19 refs. (1973)

Growth of 1,114 infants was studied, representing ca. one seventh of the total number of children in the age group. Weights of both boys and girls tend to be ca. 0.25 kg higher than those given in the 1957 Standard Tables for Australian children. Results show that a child's weight status at one year of age is a more important indicator of its weight at three years than its birth weight. Birth order is shown to be important in determining birth weight, there being a very significant increase in weight of later born children. This difference disappears with growth: one-year and three-year weights show no dependence on birth order. Lighter babies are more likely to treble their birth weight at one year than heavier ones, but it is considered that trebling ought not to be a desirable milestone in development. Advantages of regular weight checks, compiling of a weight graph on each child's weight chart and possible methods of preventing excess weight increase during the first year of life are discussed. It is intended to continue observation of these children to see if any association exists between infant weight status and future obesity.

1212 HALL, W. B. and WILLIAMS, E. R. Cyclic superimposed designs.
Biometrika 60(1):47-53, 7 refs. (1973)

Cyclic incomplete block designs are interpreted as row and column designs and used to define a class of cyclic superimposed designs which exist for any number of treatments and column size. The analysis is presented for two sets of treatments but may be generalized for further sets. Earlier work on the structure of cyclic designs is extended for this class of designs. A table of selected designs is given for 6-15 treatments in column sizes of 4, 5 and 6. Many of these designs are smaller than existing ones yet their efficiencies are comparable.

--- MARTIN, J.K.† and CUNNINGHAM, R.B. Factors controlling the release of phosphorus from decomposing wheat roots.
Aust. J. biol. Sci. 26(4):715-27, 21 refs. (1973)
See Abstract no. 1117

† Division of Soils

--- OLLEY, June † and RATKOWSKY, D.A. Role of temperature function integration in monitoring of fish spoilage.
Fd Technol. N.Z. 8(2):13, 15, 17, 7 refs. (1973)
See Abstract no. 1164

† Division of Food Research

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TRANSLATIONS

Various organizations are co-operating in a scheme to notify research workers of translations available in Australia and New Zealand. Titles submitted by them are listed as well as additions to the card catalogue of the Commonwealth Index of Scientific Translations.

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CSIRO	:	Central Library, CSIRO, P.O. Box 89, East Melbourne, Vic. 3002. Photocopies are obtainable and any charge made is at the rate of 10 cents per page.
GB	:	ASLIB, 3 Belgrave Square, London, S. W. 1, England.
NLL	:	National Lending Library for Science and Technology, Boston Spa, Yorkshire, England.
NZDIA	:	Translation Service, Department of Internal Affairs, Private Bag, Wellington, N. Z.

UNIL : Technical Librarian, Unilever Australia Pty. Ltd., G.P.O. Box 4100, Sydney, N.S.W. 2001.

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